L H Moon
& Son
Bookbinders

NATIONAL MUSEUM
OF VICTORIA

Museum Victoria
76618

17/4/17
NATIONAL MUSEUM, MELBOURNE

AUSTRALASIAN ANTARCTIC EXPEDITION

1911 - 1914.

UNDER THE LEADERSHIP OF SIR DOUGLAS MAWSON, D.Sc., B.E.

SCIENTIFIC REPORTS.

SERIES C.—ZOOLOGY AND BOTANY.

VOL. IV. PART 1.

MOLLUSCA

BY

C. HEDLEY, F.L.S.,

AUSTRALIAN MUSEUM, SYDNEY.

WITH NINE PLATES AND THREE FIGURES IN THE TEXT.

PRICE EIGHT SHILLINGS AND SIXPENCE.
TO SUBSCRIBERS: SEVEN SHILLINGS.

Printed by R. E. E. Rogers, Government Printer, North Terrace, Adelaide, South Australia.

ISSUED NOVEMBER 6TH, 1916.

Series C.—REPORT ALREADY ISSUED.

ZOOLOGY.

Vol	Part.		Price. s.	d.
III.	1.	FISHES. By Mr. Edgar R. Waite, F.L.S., South Australian Museum, Adelaide	8	6

NATIONAL MUSEUM MELBOURNE

AUSTRALASIAN ANTARCTIC EXPEDITION

1911 - 1914.

UNDER THE LEADERSHIP OF SIR DOUGLAS MAWSON, D.Sc., B.E.

SCIENTIFIC REPORTS.

SERIES C.—ZOOLOGY AND BOTANY.

VOL. IV. PART 1.

MOLLUSCA

BY

C. HEDLEY, F.L.S.,

Australian Museum, Sydney.

With Nine Plates and Three Figures in the Text.

South Australia:

R. E. E. Rogers, Government Printer, North Terrace, Adelaide.

ISSUED NOVEMBER 6th, 1916.

CONTENTS.

Introduction.—Progress of Antarctic Conchology.—Environment of Antarctic marine fauna.—Areas examined.—Local conditions at Commonwealth Bay.—Distribution by stations.—Enumeration of species collected at various Antarctic stations and at the Auckland Islands.—Macquarie Island: previous zoological examination; amelioration of climate effected by the Notonectian current; list of molluscan fauna; comparison with other subantarctic islands; beach ecology.—Account of collection in systematic order.

MOLLUSCA.

(*Exclusive of Cephalopoda.*)

By Charles Hedley.

(Plates I.-IX.)

Our knowledge of the south polar Mollusca has been considerably enlarged during the past 20 years by the work of various Antarctic Expeditions. These gains are represented by a sketch of the literature compiled by Messrs. Melvill and Standen,* and by catalogues arranged by Drs. H. Strebel,† P. Dautzenberg, H. Fischer,‡ and J. Thiele.§

Though few observations have been made, it is apparent that Antarctic waters differ from those of temperate seas by greater uniformity in vertical section. Penetration of light in these high latitudes must be brief owing both to the angle of incidence from a low sun and to the dense screen of a richer plankton. Where the temperature of the surface scarcely rises above freezing, the whole column of several hundred fathoms from the waves to the ground can hardly vary a degree.

Consequently, barriers that elsewhere confine the sublittoral fauna do not exist here ; and such fauna, except for absence of algæ, can range from beach to abyss through an almost identical environment.

Probably change from stones to ooze is the chief factor to affect distribution, and much of the deep area usually spread with ooze must be paved with moraine matter spilt from capsized icebergs.

The intense cold maintains a similar climate throughout the whole Antarctic periphery, while vigorous westerly winds establish rapid communications of drifting spores and larvæ between one district and those that lie to leeward. Monotony of environment thus tends to produce a uniform fauna and flora. A striking circumpolar distribution is shown by the largest and most conspicuous shells such as *Neobuccinum eatoni*, *Chlamys colbecki*, and *Laternula elliptica*. As the less conspicuous species are examined they will agree with the more prominent forms.

* Melvill and Standen.—Scientific results of the Scotia Expedition, v., 1907, pp. 124-127 and vi., 1912, pp. 138-140.

† Strebel.—Schwed. Südpol. Exped. vi., 1908, pp. 86-93.

‡ Dautzenberg and Fischer.—Result Camp. Scient. Monaco, xxxvii., 1912, pp. 10-15.

§ Thiele.—Deutsch. Südpol. Exped. xiii., 1912, pp. 257-270.

Dr. G. Pfeffer considered that circumpolarity in the marine fauna is more developed in the Arctic than in Antarctic regions (Ann. Mag. Nat. Hist., April, 1901, p. 302). Available information seems to me yet insufficient for this comparison.

At the eastern corner of the Australian Quadrant; Cape Adare and McMurdo Sound have been searched in succession by the expeditions that sailed in the "Southern Cross," "Discovery," "Nimrod," and the "Terra Nova." While at the western extremity of this quadrant the zoologists of the "Gauss" obtained a collection larger than those of all the eastern parties combined. Between these points, for an extent of more than 2,000 miles, nothing was known of the fauna, so that a collection from an intermediate position in Adelie Land was particularly desirable. Such a position was found in Commonwealth Bay, the main base of the Australasian Antarctic Expedition, which was examined as fully as the severe weather conditions allowed. In several features this station differed from that of McMurdo Sound. In the first place the latitude is 10° lower, and the climate presumably is correspondingly milder. Accordingly a sublittoral fauna and flora appear to rise nearer to the surface here than has been noted from any other part of Antarctica.

Usually the Antarctic ice-foot not only ploughs out all intertidal or beach life, but represses existence for a depth of several fathoms. Murray* has described how he found the ground barren down to the lowest level reached by floating ice-keels, and how, beyond 25 fathoms off Cape Royds, he found organisms not only existing, but luxuriating, in dense and continuous masses.

Unusual meteorological conditions prevail in Commonwealth Bay, the ice being generally blown out to sea as it forms, so that it rarely fringes the shore. From the surface, as far as the eye can reach down, is seen a jungle of giant algæ, among the roots and fronds of which numerous animals of all classes find shelter. The fronds of the seaweed sometimes become encased in ice, which, accumulating in large masses, lifts the weed from the ground. "A branching stem found floating in the harbour measured 18ft. in length."† On December 18th, 1913, the Mackellar Islets in Commonwealth Bay were found to be "kelp-fringed,"‡ but it is not known whether the kelp was perennial or a summer crop. The luxuriance of the kelp in February, 1912, interfered with the working of the fish trap.

Touching the Marine Biology of Commonwealth Bay, Sir D. Mawson continues (p. 165), "Hunter, with the small hand-dredge, brought up abundant samples of life from depths ranging to 50 fathoms. In water shallower than 10 fathoms the variety of specimens was not great, including seaweeds up to 18ft. or more in length, a couple of forms of star-fish, various small mollusca, two or three varieties of fish, several sea-spiders, hydroids. and lace corals, and, in greater profusion, worms and small crustaceans. In deeper waters the life became much richer, so that examples of almost every known class of marine animals were represented. Early in June the sea bottom, in depths less than 10 fathoms, had become so coated with ice that dredging in shallow water was suspended. Floating, or swimming freely, were examples of pteropods, worms,

* Murray.—Brit. Antarct. Exped. Zool. ii., 1911, p. 1. † Mawson.—"The Home of the Blizzard," ii., 1915, p. 132.
‡ Mawson.—"The Home of the Blizzard," ii., 1915, p. 258.

crustaceans, ostracods, and jelly-fish. These were easily taken in the hand-net. In these regions, where ice and water are intermingled, the temperature of the water varies very slightly in summer and winter, remaining approximately at freezing point. In summer the tendency to heating is neutralised by a solution of some of the ice, and in winter the cold is absorbed in the production of a surface layer of ice. This constancy of the sea's temperature is favorable to organic life."

This description suggests that marine organisms in the sheltered parts of Commonwealth Bay may, perhaps, endure alternations of freezing and thawing. This is an interesting question of marine bionomics which may engage the attention of future Antarctic investigators.

From this station we are fortunate in having a descending series of substations at different depths.

STATION I.

Commonwealth Bay, Adelie Land.

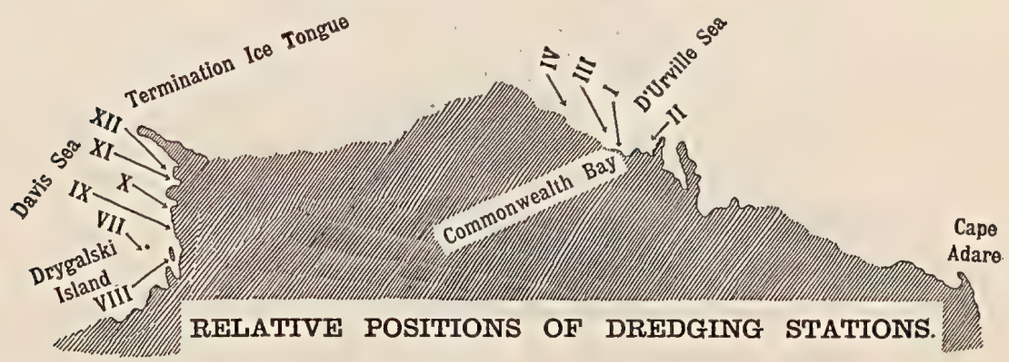


Fig. 1.

Dr. Maclean collected in 1913, from the surface of the Boat Harbour, two living Pteropods—

Clione antarctica Smith.
Cliodita caducens Quoy and Gaimard.

and in 3 fathoms in the Boat Harbour he took—

Philobrya wandelensis Lamy.
Philippiella bagei Hedley.
Submargarita crebrilirulata Smith.
Lævilitorina antarctica Smith.

From 15-20 fathoms, on a floor of rock and brown algæ, Mr. Hunter found (January 20th, 1913)—

Margarella refulgens Smith.
Submargarita crebrilirulata Smith.
Neobuccinum eatoni Smith.
Trophon longstaffi Smith.

A successful series was made on the 3rd and 4th of September, 1912 (pp. 199-200), through holes in the sea-ice, about half a mile from shore. The narrative mentions 50 fathoms, but the mollusca are labelled from 25 fathoms. They are—

Lissarca notorcadensis Melv. & Stand.
Philobrya wandelensis Lamy.
Philippiella bagei Hedley.
Adacnarca nitens Pelseneer.
Chlamys colbecki Smith.
Lima ovalis Thiele.
Laternula elliptica King & Broderip.
Kellia nimrodiana Hedley.
Margarella refulgens Smith.
Submargarita crebrilirulata Smith.
Minolia dulcis Smith.
Lepeta coppingeri Smith.
Lævilittorina antarctica Smith.
Eatoniella kerguelenensis Smith.
Ovirissoa adarensis Smith.
Subonoba bickertoni Hedley.
Subonoba gelida Smith.
Subonoba glacialis Smith.
Subonoba ovata Thiele.
Cerithiopsilla antarctica Smith.
Melanella laseroni Hedley.
Friginatica grisea von Martens.
Marseniopsis mollis Smith.
Prosipho aurora Hedley.
Prosipho hunteri Hedley.
Prosipho madigani Hedley.
Prosipho mundus Smith var. *macleani* Hedley.
Neobuccinum eatoni Smith.
Trophon condensatus Hedley.
Trophon longstaffi Smith.
Toledonia major Hedley var. *elata* Hedley.
Doris nivalis Thiele.
Tritoniella sinuata Eliot.
Notæolidia depressa Eliot.

While the "Aurora" was anchored in Commonwealth Bay, Mr. Hunter worked a small hand-dredge from the ship, and on December 14th, 1913, secured from a rich bottom, with abundance of polyzoa, in a depth of 45-50 fathoms, the following mollusca :—

Philobrya wandelensis Lamy.
Philippiella bagei Hedley.
Adacnarca nitens Pelseneer.
Cyamium rotundatum Thiele.
Callochiton gaussi Thiele.
Margarella refulgens Smith.
Submargarita crebrilirulata Smith.
Lepeta coppingeri Smith.
Eatoniella kerguelenensis Smith.
Subonoba bickertoni Hedley.
Subonoba deserta Smith.
Subonoba gelida Smith.
Subonoba glacialis Smith.
Subonoba wilkesiana Hedley.
Eumeta strebeli Thiele.
Melanella exulata Smith.
Marseniopsis mollis Smith.
Prosipho hunteri Hedley.
Prosipho madigani Hedley.
Pareuthria innocens Smith.
Trophon longstaffi Smith.
Toledonia major Hedley var. *elata* Hedley.
Notœolidia depressa Eliot.

Under similar circumstances on December 21st, 1913, from 55-60 fathoms, he took—

Lissarca notorcadensis Melvill & Standen.
Philippiella bagei Hedley.
Adacnarca nitens Pelseneer.
Ptychocardia van hoffeni Thiele.
Kellia nimrodiana Hedley.
Margarella refulgens Smith.
Submargarita crebrilirulata Smith.
Minolia dulcis Smith.
Lepeta coppingeri Smith.
Marseniopsis mollis Smith.
Pareuthria innocens Smith.
Neobuccinum eatoni Smith.
Trophon longstaffi Smith.
Trophon shackletoni Hedley.
Toledonia major Hedley var. *elata* Hedley.
Doris nivalis Thiele.
Notœolidia depressa Eliot.

On December 22nd, 1913, the vessel took up a position about four miles from Cape Hunter (Vol. II., p. 260), South Lat. 66° 50′, East Long. 142° 6′, on the west side of Commonwealth Bay. Here, with the Agassiz trawl, " a haul was made in 250 fathoms, of ascidians, sponges, crinoids, holothurians, fish, and other forms of life in such quantity that Hunter and Hamilton were occupied in sorting the specimens until 5 o'clock next morning."

The surface temperature was — 1·85 C.; very little ooze came up, and the trawl appeared to have skimmed over a continuous sheet of organic life. Towards the end of the operation the depth increased, and the following mollusca were labelled as from 350-400 fathoms :—

Lissarca notorcadensis Melv. & Stand.
Adacnarca nitens Pelseneer.
Lima hodgsoni Smith.
Callochiton gaussi Thiele.
Margarella refulgens Smith.
Minolia dulcis Smith.
Melanella exulata Smith.
Trichoconcha mirabilis Smith.
Marseniopsis mollis Smith.
Prosipho spiralis Thiele.
Trophon longstaffi Smith.
Doris antarctica Hedley.
Tritoniella sinuata Eliot.

Station II.

Proceeding eastwards, the trawl was next put over on December 28th, close to the Mertz Glacier Tongue (p. 263), South Lat. 66° 55′, East Long. 145° 21′. " Beside rocks and mud there were abundant crinoids, holothurians, corals, crustaceans, and shells." The surface temperature was — 1·8 C. The mollusca are labelled from 288-300 fathoms from ooze bottom.

Poroleda longicaudata Thiele.
Malletia sabrina Hedley.
Silicula rouchi Lamy.
Limopsis grandis Smith.
Lissarca notorcadensis Melv. & Stand.
Philippiella orbiculata Hedley.
Adacnarca nitens Pelseneer.
Lima hodgsoni Smith.
Pholadomya antarctica Hedley.
Pholadomya mawsoni Hedley.
Pholadomya adelaidis Hedley.
Thracia meridonalis Smith.

Cuspidaria infelix Thiele.
Cuspidaria plicata Thiele.
Cyamium rotundatum Thiele.
Ptychocardia rudis Hedley.
Pseudokellya stillwelli Hedley.
Minolia thielei Hedley.
Trichotropis antarctica Thiele.
Pellilitorina rossiana Smith.
Marseniopsis mollis Smith.
Harpovoluta vanhoffeni Thiele.
Oenopota davisi Hedley.
Pontiothauma ergata Hedley.
Probuccinum costatum Thiele.
Neobuccinum eatoni Smith.
Trophon coulmanensis Smith.
Trophon longstaffi Smith.
Neactæonina fragilis Thiele.
Newnesia antarctica Smith.
Toledonia globosa Hedley.
Toledonia major var. *elata* Hedley.
Notæolidia depressa Eliot.
Spiral of *Gasteropod* eggs.
Dentalium majorinum Mabille & Rochbrune.

Station III.

Steering west, the "Aurora" now recrossed Commonwealth Bay, and on the last day of 1913 shot the trawl in South Lat. 66° 32′, East Long. 141° 39′. The surface temperature was —1·62 C., depth 157 fathoms, and bottom ooze. Mollusca were represented by the following:—

Lissarca notorcadensis Melvill & Standen.
Adacnarca nitens Pelseneer.
Lima hodgsoni Smith.
Notochiton mirandus Thiele.
Callochiton gaussi Thiele.
Minolia dulcis Smith.
Trichochoncha mirabilis Smith.
Marginella hyalina Thiele.
Admete delicatula Smith.
Probuccinum tenuistriatum Hedley.

From the D'Urville Sea, between the meridians of 140 and 146, on the coast of Adelie Land, whence no mollusca were previously known, this expedition thus obtained 77 species of *Gasteropoda*, *Pelecypoda*, and *Scaphopoda*, of which 23 are new. The

four expeditions that have collected off the coast of South Victoria Land, in the Ross Sea, between the meridians of 163 and 173, have altogether reported 97 members of these groups of mollusca. From the Davis Sea the "Gauss" Expedition reported 122 species, to which the present inquiry added 12. A difference in collecting, rather than a difference in the fauna, is represented by these figures.

Station IV.

Approaching the coast of Wilkes Land on January 2nd, 1914, the trawl was lowered in South Lat. 65° 48′, East Long. 137° 32′, in 230 fathoms, bottom ooze; surface temperature —1·4° C.

The narrative refers to this (Vol. II., p. 266) as unsuccessful. The only mollusca obtained were—

Chlamys colbecki Smith.
Harpovoluta vanhoffeni Thiele.
Dentalium majorinum Mabille & Rochebrune.

Stations V. & VI.

Supplied no mollusca.

Station VII.

The "Aurora" then entered the Davis Sea, and the remainder of the stations were pivoted round the winter station of the "Gauss."

The extensive dredgings carried out here by von Drygalski anticipated a number of the species taken by Sir Douglas Mawson's party.

On January 21st, 1914, off Drygalski Island, in South Lat. 65° 42′, East Long. 92° 10′, "the dredge was lowered in 60 fathoms, and a rich assortment of life was captured" (Vol. II., p. 270). On the ground were red algæ and small rocks. The mollusca consisted of—

Trichoconcha mirabilis Smith.
Marseniopsis mollis Smith.
Trophon shackletoni Hedley.

Station VIII.

Steering towards the winter quarters of the Western Base, a position was reached in South Lat. 66° 8′, East Long. 94° 17′, where a small dredge of the Ball type was lowered in 120 fathoms on January 27th, 1914. There were small granite rocks, but no ooze, in the net, and life generally was abundant.

Philippiella orbiculata Hedley.
Adacnarca nitens Pelseneer.
Lima hodgsoni Smith.
Thracia meridionalis Smith.

Venericardia astartoides von Martens.
Pseudokellya stillwelli Hedley.
Callochiton gaussi Thiele.
Margarella refulgens Smith.
Marseniopsis mollis Smith.
Probuccinum costatum Thiele.
Doris nivalis Thiele.
Bathydoris hodgsoni Eliot.
Aegires albus Thiele.

Station IX.

Cruising along the great Shackleton Ice-shelf, a stop was made on January 28th, at South Lat. 65° 20′, East Long. 95° 27′, and the trawl was lowered in 240 fathoms, ooze bottom, temperature 1·38 C.

Poroleda longicaudata Thiele.
Chlamys colbecki Smith.
Pholadomya mawsoni Hedley.
Pholadomya adelaidis Hedley.
Cyamium rotundatum Thiele.
Submargarita smithiana Hedley.
Lepeta depressa Hedley.
Trochaclis antarctica Thiele.
Friginatica grisea von Martens.
Harpovoluta vanhoffeni Thiele.
Pontiothauma ergata Hedley.
Neobuccinum eatoni Smith.
Dentalium majorinum Mabille & Rochebrune.

Station X.

The journey along the ice-shelf was continued, and on the following day, in South Lat. 65° 6′, East Long. 96° 13′, the trawl was again lowered in 325 fathoms; the temperature was — 1·65 C., and the bottom ooze.

Poroleda longicaudata Thiele.
Malletia sabrina Hedley.
Adacnarca nitens Pelseneer.
Chlamys colbecki Smith.
Axinopsis debilis Thiele.
Thracia meridionalis Smith.
Callochiton gaussi Thiele.
Stilifer polaris Hedley.
Bathydoris hodgsoni Eliot.
Dentalium majorinum Mabille & Rochebrune.

Station XI.

Still further along the Shackleton Ice-shelf a haul was made on January 31st, 1914, in South Lat. 64° 44′, East Long. 97° 28′, in 358 fathoms on a bottom of ooze.

Malletia sabrina Hedley.
Chlamys colbecki Smith.
Lima closei Hedley.
Axinopsis debilis Thiele.
Marseniopsis mollis Smith.
Neobuccinum eatoni Smith.
Dentalium majorinum Mabille & Rochebrune.

Station XII.

Here the campaign was concluded. Before reaching the Termination Ice Tongue the trawl was sent over for the last time in South Lat. 64° 32′, East Long. 97° 20′, in 110 fathoms on January 31st, 1914.

"Half a ton of life," writes the chronicler (Vol. II., p. 275), "emptied on the deck gave the biologists occupation for several days."

Leda oblonga Pelseneer.
Limopsis grandis Smith.
Lissarca notorcadensis Melvill & Standen.
Adacnarca nitens Pelseneer.
Chlamys colbecki Smith.
Lima hodgsoni Smith.
Venericardia astartoides von Martens.
Notochiton mirandus Thiele.
Lamellariopsis aurora Hedley.
Harpovoluta vanhoffeni Thiele.
Probuccinum costatum Thiele.
Newnesia antarctica Smith.
Doris nivalis Thiele.
Notæolidia depressa Eliot.
Dentalium majorinum Mabille & Rochebrune.

Though the "Aurora" called at the Auckland Islands, no serious attempt was made to collect mollusca there. Perhaps it was thought that this archipelago had already been sufficiently investigated by a special expedition to the Subantarctic Islands of New Zealand, which had reported on it.

A haul of the dredge in one fathom, Carnley Harbour, taken June 28th, 1912, by Mr. E. R. Waite yielded—

Thoristella aucklandica Smith.
Photinula capillacea Phil. var. *minor* Smith.
Lissarca aucklandica Smith.
Leptomya perconfusa Iredale.

The Subantarctic Islands differ in their marine fauna from Antarctica almost as much as they do from such temperate zones as those of New Zealand or Tasmania. That Macquarie Island should have almost the warmest climate of its latitude is apparently effected by an extension of the Notonectian current* already reported by Du Petit-Thouars as far south as 45° 16′.

Macquarie Island, the most southern land on which vegetation flourishes, was for the conchologist undiscovered territory when Mr. Augustus Hamilton landed there for a few days in 1894. He obtained a new land shell among decaying leaves, and remarked on the contrast between the scarlet *Gaimardia* and the green *Ulva* to which it was attached.† A series from his collection was submitted by Mr. Suter to Mr. E. A. Smith, of the British Museum, who published an account of several of them.‡ Mr. Hamilton's excellent work, supplemented by further material which Dr. D. Colquhoun obtained, has served to represent the Macquarie Island fauna in Mr. Suter's Manual of the New Zealand Mollusca by the following 17 species:—

Plaxiphora superba Pilsbry.
Acmæa cantharus Reeve.
Nacella fuegiensis Reeve.
Nacella illuminata Gould.
Cantharidus pruinus perobtusus Pilsbry.
Lævilitorina hamiltoni Smith.
Lævilitorina caliginosa Gould.
Siphonaria lateralis Gould.
Laoma hamiltoni Suter.
Athoracophorus martensi Suter.
Philobrya meleagrina Bernard.
Modiolarca pusilla Gould.
Modiolarca smithi Suter.
Modiolarca trapezina Lamarck.
Lascæa miliaris Philippi.
Cyamium oblongum Smith.
Saxicava arctica Linne.

* Hedley.—Proc. Linn. Soc. N.S. Wales, xxxv., 1910, p. 9.
† Hamilton.—Trans. New Z. Inst. xxvii., 1894 (1895), p. 577. ‡ Smith.—Proc. Malac. Soc. iii., 1898, pp. 20-25.

Of these the *Acmæa*, *Athoracophorus*, and *Cyamium* were not taken by the Australasian Antarctic Expedition. The rest are represented under the same or other names in the following list. The known fauna is raised to 35 indigenous and one introduced mollusc, an European *Limax*. The following were collected from 1912 to 1914 by Mr. Harold Hamilton, a son of the pioneer investigator :—

Lepidopleurus kerguelensis Haddon.
Hemiarthrum setulosum Dall.
Plaxiphora aurea Spalowsky.
Schismope subantarctica Hedley.
Puncturella analoga Martens.
Margarella macquariensis Hedley.
Photinula coruscans Hedley.
Radiacmea macquariensis Hedley.
Nacella kerguelensis Smith.
Nacella delesserti Philippi.
Brookula sp.
Lævilitorina caliginosa Gould.
Lævilitorina hamiltoni Smith.
Eatoniopsis ainsworthi Hedley.
Tatea melvilli Hedley.
Friginatica pisum Hedley.
Trophon albolabratus Smith.
Turbonilla lamyi Hedley.
Phrixgnathus hamiltoni Suter.
Kerguelenia redimiculum Reeve.
Pronucula mesembrina Hedley.
Philippiella hamiltoni Hedley.
Chlamys subantarctica Hedley.
Chione mawsoni Hedley.
Rochefortia charcoti Lamy.
Rochefortia macquariensis Hedley.
Lasæa consanguinea Smith.
Kidderia pusilla Gould.
Kidderia macquariensis Hedley.
Gaimardia trapesina Lamarck var. *coccinea* Hedley.
Gaimardia smithi Suter.
Saxicava antarctica Philippi.

About a third of the mollusca reported from Macquarie Island extend to Kerguelen, and some range round the pole to the Falkland Islands and New Georgia.

Probably some here described as new will, in the future, be traced to other Subantarctic lands. And I expect that further search will add to the molluscan fauna of Macquarie Island, more deep-water and minute species.

Little information has reached me on the ecological aspect of the beaches at Macquarie Island. The range of the tide and temperature of the water will probably be discussed in another section of these reports.

In the narrative of the Expedition (II., p. 241) it is noted that " Very few stretches of what may be called ' beach ' occur on the island; the foreshores consisting for the most part of huge water-worn boulders or loose gravel and shingle. After a storm the sea piles up hundreds of tons of kelp on the shore, and for several days tangled masses like small islands drift about." The kelp growing on the rocks, as exposed at low tide, is shown on the plate facing p. 44 of " The Home of the Blizzard."

Now that Macquarie Island has been so fully examined, the Crozets probably remain the least zoologically known of the Subantarctic islands.

The systematic account of the species is as follows :—

Class PELECYPODA.

Pronucula mesembrina *sp. nov.*

(Plate I., figs. 1 and 2.)

Shell small, oblique, triangularly ovate, moderately inflated, inequilateral, clothed with a tough persistent buff epidermis. Beak prominent, set at about three-quarters of the length. Upper and central portion of the valve with fine, irregular, concentric growth lines, the lower half with about 50 delicate and crowded radial riblets. Interior brilliantly nacreous, with a silver lustre; the radials show an imprint, and denticulate the inner margin of the valve. Muscle scars not visible. Hinge with the chondrophore apart from the teeth, of which there are five tubercles and sockets on the posterior side and three on the anterior.

Length, 2·2; height, 1·7mm.

The species is represented by a single left valve, broken at the anterior edge. This was fast to the web of a worm tube, taken January 19th, 1912, at Aerial Cove, Macquarie Island, by Mr. H. Hamilton. This is the fourth member of its genus, the others being *P. decorosa* Hedley, from New South Wales; *P. hedleyi* Pritchard and Gatliff, from Tasmania; and *P. kermadecensis* Oliver, from the Kermadecs.

Leda oblonga *Pelseneer.*

Leda oblonga Pelseneer, Zool. " Belgica," Moll., 1903, p. 23. pl. vi., figs. 79, 80.

The type of this species came from the opposite end of Antarctica; but one entire shell and one single valve agree precisely with Pelseneer's figures and description, except that Mawson's specimens are 5mm. long, and the " Belgica's " only 4mm. These were dredged January 31st, 1914, in 358 fathoms ooze, off the Shackleton Ice-shelf in South Lat. 64° 44′ and East Long. 97° 28′.

Poroleda longicaudata *Thiele.*

Leda longicaudata Thiele, Deutsch. Südpol. Exped. xiii., 1912, p. 229, pl. xvii., fig. 22.

The sculpture is here stronger than in others of the genus. Large specimens are proportionately narrower than small ones, and the species grows larger than hitherto recorded, as a specimen from Station II. is 20mm. long, and another from Station X. is 21mm.

Three dredged, December 28th, 1913, in 288 fathoms, ooze, off the eastern barrier of Adelie Land, in South Lat. 66° 52′ and East Long. 145° 30′. Ten, January 28th, 1914, from 240 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 20′ and East Long. 95° 27′. Four, January 29th, 1914, from 325 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 64° 44′ and East Long. 96° 13′.

Malletia sabrina *sp. nov.*

(Plate I., figs. 3, 4.)

Shell moderately solid, oblong, posterior side twice the length of the anterior; dorsal and ventral margins parallel, anterior end rounded; posterior end obliquely truncate; beaks prominent. Valves slightly gaping at each extremity. Epidermis thin, continuous, olive yellow. Surface glossy, with an iridescent sheen. Concentrically striated, irregularly and faintly for most of the disc, but closely and sharply near the umbo. An obscure angle indicates the escutcheon. The hinge has 11 teeth on the anterior side and 13 on the posterior. Length, 10·5; height, 6; breadth of conjoined valves, 4mm.

This most southern member of its genus is named in remembrance of an exploring vessel, the "Sabrina," which disappeared in these seas in 1839. Seven complete specimens, including the type, were taken January 29th, 1914, in 325 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 6′ and East Long. 96° 13. Another, January 31st, 1914, in 358 fathoms, ooze, off the same glacier, in South Lat. 64° 44′ and East Long. 97° 28′. Again, a separate valve, December 28th, 1913, in 288 fathoms, ooze, off the Mertz Ice Tongue, in South Lat. 66° 55′, East Long. 145° 21′.

Silicula rouchi *Lamy.*

Silicula rouchi Lamy, 2nd Expéd. Antarct. Franç., 1911, Moll., p. 30, pl. i., figs. 24, 25.

Two specimens dredged December 28th, 1913, in 288 fathoms, ooze, off the Eastern Barrier of Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′.

Limopsis grandis *Smith.*

Limopsis grandis Smith, Nat. Antarct. Exped. ii., 1907, Moll., p. 5, pl. iii., fig. 7; and "Terra Nova" Exped., Moll., 1915, p. 76. *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 228, pl. xvii., figs. 14, 15.

A single specimen, 7mm. long, taken alive, December 28th, 1913, in 288 fathoms, ooze, off the Mertz Glacier Tongue, in South Lat. 66° 52′ and East Long. 145° 30′. Two odd valves, one grander than any yet reported, being 45mm. long and 38mm. high, dredged in 110 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 64° 44′ and East Long. 97° 28′.

Lissarca aucklandica *Smith.*

Lissarca aucklandica Smith, Collections "Southern Cross," 1902, p. 212, pl. xxiv., figs. 14, 15.

Three separate valves dredged, June 28th, 1912, in one fathom, Carnley Harbour, Auckland Islands.

Lissarca notorcadensis *Melvill and Standen.*

Lissarca notorcadensis Melvill and Standen, Trans. Roy. Soc. Edinb. xlvi., 1907, p. 144, figs. 14, 14A; *Id.*, Scotia, Zool., v. 1907, p. 114, fig. 14; *Id.*, Smith, "Terra Nova" Exped., Moll., 1915, p. 75, pl. i., figs. 16, 17.

Arca gourdoni Lamy, 2nd Expéd. Antarct, Franç., 1911, Moll. p. 28, pl. i., figs. 21, 22.

Lissarca gourdoni Thiele, Deutsch. Südpol. Exped. xiii., 1912, p. 228, pl. xviii., fig. 3.

One specimen, 8mm. long and 6·5mm. high, is larger than any previously recorded.

Forty, October 4th, 1912, from 25 fathoms, hard bottom; seven, December 21st, 1913, from 55-60 fathoms, hard bottom; and again one, December 22nd, 1913, from 350-400 fathoms, ooze, all in Commonwealth Bay; seven, December 28th, 1913, from 288 fathoms, ooze, off the Eastern Barrier of Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′; seven, December 31st, 1913, from 157 fathoms, ooze, South Lat. 66° 32′ and East Long. 141° 39′; thirty-five, January 31st, 1914, in 110 fathoms, off the Shackleton Ice-shelf, in South Lat. 64° 32′ and East Long. 97° 20′.

Philobrya wandelensis *Lamy.*

Philobrya wandelensis Lamy, Bull. Mus. Hist. Nat., xii., 1906, p. 50; *Id.*, 1st Expéd. Antarct. Franç., 1906, Moll., p. 17, pl. i., fig. 15-16; *Id.*, *op. cit.*, 2nd Expéd. Franç., 1911, Moll., p. 24; *Id.*, Melvill and Standen, Trans. Roy. Soc. Edinb., xlvi., 1907, p. 146; *Id.*, *op. cit.*, xlviii., 1912, p. 361; *Id.*, Scotia Zool., v., 1907, p. 116.

Numerous specimens from 25 fathoms in Commonwealth Bay, where it was the most abundant bivalve; four were dredged, December 14th, 1913, in 45-50 fathoms. Two specimens were collected by Dr. McLean in 1913 from 3 fathoms in the Boat Harbour, Commonwealth Bay.

Philippiella bagei *sp. nov.*

(Plate I., figs. 5, 6, 7.)

In Antarctic waters is developed *Philippiella*,* a genus the simplicity of whose features suggests that it may be either a primitive or a retrograde member of the subfamily Philobryinæ. Here I would include *P. ungulata* Pfeffer, *P. quadrata* Pfeffer, *P. limoides* Smith, *P. lævis* Thiele, *P. tumida* Thiele, *P. bagei* Hedley, and *P. orbiculata* Hedley. But I would now exclude *P. crenatulifera* Tate, and *P. rubra* Hedley, which, under a misapprehension of the original diagnosis, I formerly included (Proc. Linn. Soc. N.S.W., 1904, p. 208) here. For these I now propose a genus *Notomytilus*, type *Philippiella rubra* Hedley. The *Philippiella* proper are characterised by large size, profuse epidermis, smooth surface, thin shell, and weak, undeveloped, toothless hinge. The edentulous hinge is exactly correlated with a far southern habitat.

The ligament is elongate and horizontal, that is, it runs along the dorsal margin instead of descending obliquely across the hinge-plate as in *Hochstetteria*. There are neither anterior nor posterior crenulated areas nor dysodont teeth as in *Philobrya* and *Hochstetteria*. The anterior dorsal margin of both valves in *Philippiella* project and interlock, thus acting as cardinal teeth. The anterior end of the valve is less abbreviated than in related genera. Apart from size and the prodissoconch shield, there is a striking resemblance between *Philippiella* and *Meleagrina*. Cardinal features, so useful for the discrimination of *Philobrya*, are here wanting, so that contour is left as the chief guide in distinction of species.

The valve of *P. bagei* is ovate acuminate, with the anterior side considerably developed. The margin of the right is sometimes bent in, while the left over-reaches it. Prodissoconch small, flat, semi-lunate. Surface of adult smooth, on which fine concentric and radial threads form microscopic reticulations. Byssus, a bunch of numerous strings leading through a narrow chink high on the anterior side. Epidermis, long dense imbricating leaves like that of the pearl-mussels, projecting far past the margin of the valve. Each leaf has a mid-rib, and this alone continues on the upper part of the valve. Inner ventral margin smooth. This species is like, but larger than, *P. limoides*, in which the anterior and dorsal sides meet at a more acute angle, the valve is deeper, and the crenulations on the inner ventral margin strong. Height, 13·5; length, 12; depth of conjoined valve, 7mm.

This shell is named in honour of Captain R. Bage, of the main base party, who subsequently was killed in action at the Dardanelles at the early age of 27. He was leader of the southern sledge party, and was one of those who volunteered to endure a second Antarctic winter for the sake of his lost leader.

A couple of dozen were taken alive attached to weed and shell in 3 and 25 fathoms; one, December 14th, 1913, in 45-50 fathoms; and, again, one in 55-60 fathoms, December 21st, 1913, all in Commonwealth Bay.

* Pfeffer.—Jahrb. Hamb. Wiss. Anst., iii., 1887, p. 119.

Philippiella hamiltoni *sp. nov.*

(Plate I., figs. 8, 9, 10, 11.)

Shell rather large and solid, inflated, unilateral, in shape passing from trapezoidal when young to mussel-form in the adult. Umbo terminal, projecting, dorsal margin straight, posterior and ventral margins rounded, anterior side concave above, convex below. Colour buff. Epidermis dense, persistent, developing about a dozen radiating rows of long dense bristles which project beyond the margin; between the rows the surface is closely latticed with transverse lamellæ. Under the epidermis the surface of the valve is concentrically irregularly striated. Prodissoconch a simple semi-circular unsculptured plate slightly bulged. Ligament visible externally along half the dorsal margin. Hinge with a single stout tuberculate tooth in the anterior extremity of the left valve, which is independent in youth, but in the adult coalesces with the margin of the valve. Beneath it is excavated in the hinge plate a broad shallow byssal chamber. All the inner margin of the valve is smooth. Height, 6; length, 4·5mm.

Thirty specimens were found by Mr. Harold Hamilton, after whom it is named, some embedded in sand and spongy growth below low water, January 2nd, 1913, in Lusitania Bay; others on an old anchor recovered February 12th, 1913, at the Nuggets, Macquarie Island.

This species differs from *P. meleagrina*,* for which it has, I think, been mistaken, by being much larger, by its *Mytilus* shape, by the ligament being continued beneath the predissoconch to the anterior side, and by being more excavate around the byssus orifice.

Philippiella orbiculata *sp. nov.*

(Plate I., figs. 12, 13.)

Shell large, compressed, discoidal, anterior side well developed. Colour buff. Surface glossy, concentrically engraved. Heavily draped with epidermis toward the margin, whence lines of epidermis stalks radiate to the umbo. Inner margin of the valve finely crenulate. This, which is perhaps the largest of the *Philobryinæ*, has the following dimensions:—Height, 15; length, 15; depth of conjoined valves, 5mm.

Four, including type, December 28th, 1913, from 288 fathoms, ooze, off the Eastern Barrier of Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′; three more, January 22nd, 1914, from 120 fathoms, stony ground, in South Lat. 66° 8′ and East Long. 94° 17′.

* Bernard.—Journ. de Conch., xlv., 1897, p. 12, pl. i., fig. 3.

Adacnarca nitens *Pelseneer.*

Adacnarca nitens Pelseneer, Voy. "Belgica" Moll., 1903, pp. 24, 41, pl. vii., figs. 83-88; *Id.*, Lamy, 1st Expéd. Antarct. Franç., 1906, Moll., p. 19; *Id.*, Smith, Nat. Antarct. Exped., ii., 1907, Moll., p. 5, pl. iii., fig. 6; *Id.*, Mortensen, Deutsch. Südpol. Exped. Zool., xi., 1909, p. 20, pl. ii., fig. 2; *Id.*, Lamy, 2nd Expéd. Antarct. Franç., 1911, Moll., p. 27; *Id.*, Hedley, Brit. Antarct. Exped., ii., 1911, Moll., p. 3; *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 228; *Id.*, Smith, "Terra Nova" Exped. Zool., 1915, p. 76.

This species develops a wide range in depth and longitude, comparable to that of *Neobuccinum eatoni* or *Chlamys colbecki*. The largest individuals of this collection reach the size noted by Smith of length 6·5 and height 7mm. The mollusc clings to stalks of plants and such objects with a few sparse byssus threads.

One, October 4th, 1912, in 25 fathoms; one, December 14th, 1913, in 45-50 fathoms; one, December 21st, 1913, in 55-60 fathoms; and one, December 22nd, 1913, in 350-400 fathoms—all in Commonwealth Bay. Again, eight, December 28th, 1913, in 288 fathoms, ooze, off the Eastern Barrier of Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′; two, December 31st, 1913, in 157 fathoms, South Lat. 66° 32′ and East Long. 141° 39′; three, January 27th, 1914, in 120 fathoms, stony ground, in Davis Sea, in South Lat. 66° 8′ and East Long. 94° 17′; two, January 29th, 1914, in 325 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 6′ and East Long. 96° 13′; and two, January 31st, 1914, in 110 fathoms, off the Shackleton Ice-shelf, in South Lat. 64° 32′ and East Long. 97° 20′.

Chlamys colbecki *Smith.*

Pecten colbecki Smith, "Southern Cross" Coll., 1902, p. 212, pl. xxv., fig. 11; *Id.*, Melvill and Standen, Trans. Roy. Soc. Edinb., xlvi., 1907, p. 146; *Id.*, *Ibid.*, Scotia Zool., v., 1907, p. 117; *Id.*, Smith, Nat. Antarct. Exped., ii., 1907, Moll., p. 6, pl. iii., fig. 9; *Id.*, Lamy, 2nd Expéd. Antarct. Franç., 1911, Moll., p. 23; *Id.*, Hedley, Brit. Antarct. Exped., ii., 1911, pp. 1, 3; *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 225, pl. xvii., fig. 1.

Chlamys colbecki Smith, "Terra Nova" Exped., ii., Zool., 1915, p. 77.

Pecten racovitzai Pelseneer, Voy. "Belgica," Moll., 1903, p. 27, pl. viii., figs. 101, 102; *Id.*, Lamy, 1st Expéd. Antarct. Franç., 1906, p. 16, pl. 1., figs. 19-21.

This species continues to develop a circumpolar range. The largest of the collection here examined has a height of 85 and a length of 90mm.

It is significant of the vertical uniformity of the temperature in these seas that the finest example should come from the deepest haul, and that though, as Murray says, abundant in shallow water.

A few fragments, September 3rd, 1912, and January 20th, 1913, from 15-25 fathoms, Commonwealth Bay. A fragment, January 2nd, 1914, from 230 fathoms, ooze, in South Lat. 65° 48′ and East Long. 137° 32′. Numerous specimens, some alive, January 29th, 1914, from 325 fathoms, ooze, off the Shackleton Ice-shelf. A few, January 28th, 1914, from 240 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 20′ and East Long. 95° 27′; and a few more, including the large example already mentioned, January 31st, 1914, from 358 fathoms, in ooze, off the Shackleton Ice-shelf, South Lat. 64° 44′ and East Long. 97° 28′. A fragment, January 31st, 1914, from 110 fathoms, off the Shackleton Ice-shelf, in South Lat. 64° 32′ and East Long. 97° 20′. A single valve was obtained by Mr. C. T. Harrisson in 270 fathoms, off the Glacier near the Western Base.

Chlamys subantarctica *sp. nov.*

(Plate II., figs. 14, 15.)

Shell large, solid, oval, moderately inflated. Auricles nearly equal. Colour pink, paler towards the margins. At an inch from the umbo there are 27 radial ribs passing from simple to compound, so that at the margin each rib is split into a bundle of three or four riblets, while one or two similar riblets occupy each intervening furrow. From less worn parts it appears that these furrows were closely latticed by concentric laminæ. Height, 80; length, 75; depth of single valve, 15mm.

This is very close to a recent Tasmanian species identified as *C. antiaustralis* Tate,* but is rather shorter in proportion to height and has the auricles more coarsely ribbed.

The original of this description is a rather worn single valve with a large gap in the margin. It was dredged December 4th, 1913, in 14 fathoms, sandy bottom, Lusitania Bay, Macquarie Island. Perhaps the young of this is represented by a perfect specimen 6mm. high, of a cadmium yellow colour, from an anchor recovered by the "Rachel Cohen," off the Nuggets, Macquarie Island, in 12 fathoms.

Except *C. colbecki*, no species from so high a latitude reaches this size.

Lima closei *n. sp.*

(Plate II., fig. 16.)

Shell small, slightly oblique, thin, rather broad and shallow. Colour white. Sculpture, about 40 narrow close-set radial ribs, more crowded at the side than in the centre, but absent from the auricles; these carry small sharp scales and are crossed by dense fine growth lines. Umbones prominent and central. Interior showing a faint imprint of the exterior ribs. Height, 10·5; length, 8·5; depth of single valve, 2mm.

* Hedley.—"Endeavour" Results, i. 1911. p. 96.

Compared with *L. hodgsoni* this species is less inflated, broader in comparison to length, and more delicately sculptured.

One valve was procured, January 31st, 1914, from 358 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 64° 44′ and East Long. 97° 28′. It is named in honour of Mr. J. H. Collinson Close, F.R.G.S., an active member of the Main Base party.

Lima hodgsoni *Smith.*

Lima hodgsoni Smith, Nat. Antarct. Exped., ii., 1907, p. 6, pl. iii., fig. 8; *Id.*, Hedley, Brit. Antarct. Exped., ii., 1911, pp. 2, 3; *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 226; *Id.*, Smith, "Terra Nova" Exped., Zool., ii., 1915, p. 77.

Six were taken, December 22nd, 1913, in 350-400 fathoms, on hard ground in Commonwealth Bay. Ten, December 28th, 1913, in 288-300 fathoms, ooze, off the Eastern Barrier of Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′. Seven, January 27th, 1914, in 120 fathoms, stony ground, in South Lat. 66° 8′ and East Long. 95° 27′, one pair of which being 32mm. high is larger than previous records. Two, December 31st, 1913, from 157 fathoms, in South Lat. 66° 32′ and East Long. 141° 39′; and a single valve, January 31st, 1914, from 110 fathoms, off the Shackleton Ice-shelf, in South Lat. 64° 32′ and East Long. 97° 20′.

Lima ovalis *Thiele.*

Lima ovalis Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 226, pl. xvii., fig. 5.

Half a dozen empty shells and odd valves were dredged, September 4th, 1912, in 25 fathoms, Commonwealth Bay. These attain a larger size than the type, being 9mm. in height and 7·5mm. in breadth.

Gaimardia smithi *Suter.*

(Plate II., figs. 17, 18, 19.)

Modiolarca bicolor Smith, Proc. Malac. Soc., iii., 1898, p. 25, fig. 3 (not *Modiolarca bicolor* Martens, 1885).

Modiolarca smithi Suter, Manual N.Z. Moll., 1913, p. 895, pl. lii., fig. 7.

A single specimen was collected, February 22nd, 1912, by Mr. H. Hamilton, in Hassellborough Bay, Macquarie Island. On the occasion of its discovery it occurred more plentifully to Mr. A. Hamilton.

Gaimardia trapezina *Lamarck.*

var. coccinea *var. nov.*

(Plate II., figs. 20, 21, 22.)

Modiola trapesina Lamarck, An. s. Vert., vi., 1819, p. 114; *Id.*, Delessert, Recueil., 1841, pl. xiii., fig. 7.

Gaimardia trapesina Gould, Am. Expl. Exped., xii., Moll., 1852, p. 459, pl. xli., fig. 568.

Phaseolicama trapezina Hupe, Hist. Chile, Zool., viii., 1854, p. 323, pl. viii., fig. 9.

Modiolarca trapezina H. and A. Adams, Gen. Rec. Moll., ii., 1857, p. 520, pl. cxxii., fig. 1; *Id.*, Chenu, Man. de Conch., ii., 1862, p. 156, figs. 777-9; *Id.*, Smith, Phil. Trans. Vol., 168, 1879, p. 190, and Chall. Rep. Zool., xiii., 1885, p. 279; *Id.*, Martens and Pfeffer, Jahrb. Hamburg Wiss. Anst., iii., 1887, p. 127, pl. iv., fig. 13; *Id.*, (+ *M. crassa* + *M. cannellieri* + *M. lephayi* + *M. savatieri* + *M. fuegiensis* + *M. hahni*, all of M. & R., fide Stempell), Rochebrune and Mabille, Miss. Scient. Cap Horn, 1889, Moll., pp. 120-123, pl. vii., figs. 1, 2, 3, 4, 5, 6, 7; *Id.*, Smith, Proc. Malac. Soc., iii., 1898, p. 24; *Id.*, Melvill and Standen, Journ. of Conch., ix., 1898, p. 104, and x., 1901, p. 47; *Id.*, Stempell, Zool. Jahrb. Suppl., iv., 1899, p. 327; *Id.*, Pelseneer, Voy. "Belgica," Moll., 1903, p. 11; *Id.*, Lamy, Ann. Inst. Oceanograph, iii., 1911, p. 44; *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 252; *Id.*, Suter, Man. N.Z. Moll., 1913, p. 896, pl. lxiii., fig. 6; *Id.*, Lamy, Bull. Mus. Hist. Nat., xxi., 1915, p. 75.

Gaimardia trapezina Iredale, Trans. N.Z. Inst., xlviii., (1914) 1915, p. 487.

At Macquarie Island, this is abundant. Mr. A. Hamilton writes*—"The most attractive shell is a bright scarlet bivalve which attaches itself to the bright green Ulva in the rock pools and to the kelp in the deeper water, it is very plentiful."

According to Mr. E. A. Smith, it has a wide circumantarctic range, from Patagonia, the Falkland Islands, South Georgia, and Kerguelen to Macquarie Island. The eight forms, separated by Mabille and Rochebrune but united by Stempell, speak for the variability of the species. A large series from Macquarie are constant in form and colour, and, judging from literature, so differ from South American representatives as to be worth, at least, varietal distinction. Accordingly, it is now proposed to term it var. *coccinea*. All the Macquarie Island shells are uniform vermilion outside and peach-blossom pink within. South American specimens are described as yellow and brown. The largest of 300 Macquarie shells is only 19mm. long, whereas Lamarck's type is 22mm. and *Modiolarca crassa* is 32mm. long. The drawings of Delessert and Gould show a form much longer in proportion to height. And if Chenu's figure is to be trusted the hinge of Lamarck's species differs from that of the Macquarie Island shell.

* Hamilton.—Trans. N.Z. Inst., xxvii., 1894 (1895), p. 577.

It has been shown by Mr. T. Iredale * that *Modiolarca* was first introduced by Gray as a genus name for *Musculus impactus*. For the species under consideration it therefore becomes necessary to adopt Gould's *Gaimardia*.

Among recent writers Pelseneer has emphasised the distinction from the *Mytilidæ* of this family, which should now be called the *Gaimardiadæ*.

Kidderia macquariensis *sp. nov.*

(Plate II., fig. 23, 24.)

Shell small, solid, oblong; dorsal and ventral margins nearly straight and parallel, posterior margin rounded, anterior briefly produced. Colour white to cream against which the orange-brown prodissoconch is sharply contrasted, sometimes brick red on the posterior or dorsal area. Sculpture fine and coarse growth lines, the latter crumpling the surface. A few faint radial threads sometimes appear about the centre of the valve. Surface glossy. Beaks at three-quarters of the length, incurved approaching. Length, 8; height, 4; depth of conjoined valves, 3·5mm.

Mr. H. Hamilton found three, February 22nd, 1914, at Hassellborough Bay, and 20 in April, 1912, on a sandy beach near the north end of Macquarie Island.

This species has been accepted in New Zealand for *Cyamium oblongum* Smith, but it does not harmonise with the original account and shadow-picture of that shell. *Modiolarca bicolor* Martens, from New Georgia, seems to be nearly allied to, and possibly identical with, this new species.

Kidderia pusilla *Gould.*

(Plate II., figs. 25, 26, 27.)

Mytilus pusillus Gould, Proc. Bost. Soc. Nat. Hist., iii., 1850, p. 345; *Id.*, U.S. Expl. Exped., xii., 1852, p. 455, pl. xliv., fig. 585.

Modiolarca pusilla Dall, Bull. U.S. Nat. Museum, iii., 1876, p. 47; *Id.*, Smith, Phil. Trans. Roy. Soc., vol. 168, 1879, p. 191; *Id.*, Mabille and Rochebrune, Miss. Scient. Cap Horn, 1889, Moll., p. 124; *Id.*, Smith, Proc. Malac. Soc., iii., 1898, p. 24; *Id.*, Melvill and Standen, Journ. of Conch., ix., 1898, p. 104; *Id.*, Suter, Subantarctic Is. of N.Z., i., 1909, p. 44, and Manual N. Z. Moll., 1913, p. 895, pl. lii., fig. 6.

On the one hand I note that there are various discrepancies in size, form, and colour between a series from Macquarie Island and the account of Patagonian specimens given by Gould. On the other hand Dr. Dall has written that "Gould's figure does not well represent his typical specimens," and Mr. E. A. Smith has recognised *K. pusilla* from Macquarie Island.

* Iredale.—Proc. Malac. Soc., xi., 1914, p. 173.

Compared with Gould's illustration the Macquarie shells are more regularly oval, the dorsal and ventral margins more parallel and the anterior end rounder. Instead of being bright red, ours are chocolate brown edged on the margin with buff. Ours seem smaller than the type, for the largest among a couple of hundred shells are only 4 instead of 5mm. long, and $2\frac{1}{2}$ instead of 3mm. high. A Macquarie Island shell is, therefore, here figured to illustrate the discrepancy, if such there be.

It was found to be common in clusters on rocks above and below high-water mark and on kelp in Garden Bay and Hassellborough Bay, Macquarie Island, by Mr. Harold Hamilton.

Axinopsis debilis *Thiele.*

Axinopsis debilis Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 232, pl. xviii., fig. 25.

One specimen, 6·5 long, 7 high, and 3mm. in depth of conjoined valves, was dredged January 31st, 1914, in 358 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 64° 44′ and East. Long. 97° 28′. Two others, January 29th, 1914, in 325 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 6′ and East Long. 96° 13′.

Laternula elliptica *King and Broderip.*

Anatina elliptica King and Broderip, Zool. Journ., v., 1831, p. 335; *Id.*, Griffith and Pidgeon, Anim. Kingdom, xii., 1834, p. 595, pl. xx., fig. 3; *Id.*, Reeve, Conch, Icon., xiv., 1860, *Anatina*, pl. ii., fig. 14; *Id.*, Smith, Chall. Rep. Zool., xiii., 1885, p. 76; *Id.*, Smith, "Southern Cross" Coll., 1902, p. 210, pl. xxv., figs. 9, 10; *Id.*, Lamy, 1st Expéd. Antarct. Franç., 1906, p. 14; *Id.*, Smith, Nat. Antarct. Exped., ii., 1907, Lamell., p. 1, pl. iii., fig. 3; *Id.*, Melvill and Standen, Trans. Roy. Soc. Edinb., xlvi., 1907, p. 151; *Id.*, Scotia Zool., v., 1907, p. 121; *Id.*, Lamy, 2nd Expéd. Antarct. Franç., 1911, Moll., p. 21; *Id.*, Hedley, Brit. Antarct. Exped., ii., 1911, p. 3; *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 256; *Id.*, Smith, "Terra Nova" Exped., Zool., ii., 1915, p. 78; *Id.*, Lamy, Bull. Mus. Hist. Nat., xxi., 1915, p. 74.

Anatina prismatica Sowerby, Proc. Zool. Soc., 1834, p. 87.

A considerable series, which vary a good deal in proportion of height to length, of empty shells and separate valves were taken, September 4th, 1912, in 12 fathoms, in Commonwealth Bay, on a bottom of small stones and weed.

The genus *Laternula* * was introduced for *Mya truncata* Linne, and *Solen anatinus* Linne. The former being a typical *Mya*, it is convenient to regard *S. anatinus* as the type of *Laternula* taking precedence, as Dr. Dall has already remarked, over *Anatina* proposed for the same type by Lamarck in 1809.

* Bolten.—Mus. Bolt., ii., 1798, p. 155.

Pholadomya adelaidis *sp. nov.*

(Plate III., figs. 31, 32.)

In other features than size and sculpture this resembles *P. mawsoni*. Shell ovate-oblong, little inflated, slightly gaping posteriorly. Surface with about 38 lines of radials, the intervals thinly granose. Length, 10; height, 8; depth of conjoined valves, 5mm.

A single specimen with both valves intact was dredged, December 28th, 1913, in 288 fathoms, off the Eastern Barrier of Adelie Land, in South Lat. 66° 52′ and East Long. 145° 30′. The anterior part of left valve, twice the size of type, January 28th, 1914, from 240 fathoms, in ooze, off the Shackleton Ice-shelf, in South Lat. 65° 20′ and East Long. 95° 27′.

Pholadomya antarctica *sp. nov.*

(Plate III., fig. 28.)

Shell small, ovate, thin, inflated, opaque posterior side twice as long as the anterior. Surface uniformly covered with dense, small, sharp grains arranged radially. Lunule not defined. Interior nacreous, no pallial sinus. Chondrophore projecting as a small spoon process beneath the beak. Length, 12; height, 8·5; breadth of single valve, 4mm.

A single right valve, January 28th, 1914, from 240 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 20′ and East Long. 95° 27′.

Pholadomya mawsoni *sp. nov.*

(Plate III., figs. 29, 30.)

Shell rhomboid-oval, small, very thin, glassy, translucent, beaks at the anterior third, valve medially inflated, anterior end short and pouting, posterior end compressed, square-ended above, below rounded to the deeply-curved ventral margin, dorsal margin rather straight, slightly gaping at the posterior end. Left valve over-reaching the right ventrally so that the margin of the right is often tucked in under the left. Beaks low, inflated, incurved anteriorly, not eroded Lunular area small, smooth, concave. Colour uniform pearl grey. Surface with a silken sheen, devoid of granules, sculptured by irregular, delicate, concentric growth striæ and traversed by from 25 to 30 narrow radiating lines of erect epidermal bristles. These extend across the whole valve except the lunule and increase by intercalation. Muscular impressions not visible owing to the thinness of the shell. An internal resilium lies upon an ossicle and is immediately beneath the beaks. Length, 13; height, 9; depth of conjoined valves, 6mm.

This, one of the most interesting shells of the collection, is dedicated to the distinguished leader of the Expedition, Sir Douglas Mawson.

Twelve complete specimens, including the type, were dredged, December 28th, 1913, from 288 fathoms, ooze, off the Eastern Barrier of Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′. Also a single valve, January 28th, 1914, from 240 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 20′ and East Long. 95° 27′.

Thracia meridionalis *Smith.*

Thracia meridionalis Smith, Chall. Rep. Zool., xiii., 1885, p. 68, pl. vi., fig. 4; *Id.*, Lamy, 1st Expéd. Antarct. Franç., 1906, Moll., p. 15; *Id.*, 2nd Expéd., 1911, p. 22; *Id.*, Hedley, Brit. Antarct. Exped., ii., 1911, Moll., p. 3; *Id.*, Smith, "Terra Nova" Exped., ii., 1915, p. 78.

Mysella? truncata Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 230, pl. xviii., fig. 18.

One complete specimen, December 28th, 1913, from 288 fathoms, ooze, off the Mertz Glacier Tongue in Adelie Land, South Lat. 66° 55′ and East Long. 145° 20′. Another, January 27th, 1914, from 120 fathoms, hard ground, in the Davis Sea, in South Lat. 66° 8′ and East Long. 94° 17′. Another, January 29th, 1914, from 325 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 6′ and East Long. 96° 13′.

Cuspidaria infelix *Thiele*

Cuspidaria infelix Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 233, pl. xviii., fig. 28.

Four separate and broken valves, January 28th, 1914, from 240 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 20′ and East Long. 95° 27′.

Cuspidaria plicata *Thiele.*

Cuspidaria plicata Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 233, pl. xviii., fig. 30.

The type of this is only 8mm. long. A series before me includes a perfect shell 6mm. long, two odd valves about 15mm. long, leading to a large broken specimen which is still 30mm., and probably reached 35mm. in length. These were dredged, December 28th, 1913, in 288 fathoms, ooze, off the Eastern Barrier of Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′.

Leptomya perconfusa *Iredale.*

Tellina lintea Hutton, Catalogue Marine Mollusca of New Zealand, 1873, p. 67.

Leptomya lintea Suter, Manual New Zealand Mollusca, 1913, p. 956, pl. liv., fig. 14.

Leptomya perconfusa Iredale, Trans. N.Z. Inst., xlvii., (1914) 1915, p. 489.

Three specimens, June 28th, 1912, from 1 fathom, in Carnley Harbour, Auckland Islands.

Cyamium rotundatum *Thiele.*

Cyamium rotundatum Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 231, pl. xviii., fig. 20.

One specimen dredged, December 14th, 1913, in 45-50 fathoms, Commonwealth Bay; two, December 28th, 1913, in 288 fathoms, ooze, off the Eastern Barrier of Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′; and one, January 28th, 1914, in 240 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 20′ and East Long. 95° 27′.

Touching *Cyamium*, it may be noted that Thiele (*op. cit.*, p. 270) has transferred *Diplodonta incerta* Smith to *Cyamium* rather than to *Cyamiomactra*. Judging from nomenclature there is an insistent demand for the latter genus because, subsequent to its introduction by Bernard in 1897, it has been independently recognised as *Heteromactra* by Lamy in 1906, as *Acolus* by Jukes Brown in 1913, and as *Jukesena* by Iredale in 1915.

Venericardia astartoides *von Martens.*

(Plate III., figs. 33, 34.)

Cardita astartoides von Martens, Sitz. Gesell. Nat. Fr. Berlin, 1878, p. 25; *Id.*, Smith, Chall. Rep. Zool., xiii., 1885, p. 212, pl. xv., fig. 2; and *Id.*, Coll., "Southern Cross," 1902, p. 211; *Id.*, Nat. Antarct. Exped., ii., 1907, Lamell., p. 2; and *Id.*, "Terra Nova" Exped., ii., 1915, Moll., p. 77; *Id.*, Lamy, 1st Expéd. Antarct. Franç., Moll., 1906, p. 14; and 2nd Expéd. Antarct. Franç., Moll., 1911., p. 21; and Bull. Mus. Hist. Nat., xxi., 1915, p. 74; *Id.*, Hedley, Brit. Antarct. Exped., ii., 1911., Moll., p. 3; *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 230, pl. xviii., fig. 10.

The series gathered by this Expedition range from 6 to 29mm. in length. It shows that as the species increases in size the radial sculpture becomes fainter and, as Mr. Smith has already observed, the height increases in proportion to the length. Without the aid of a connecting series the younger individuals would scarcely be recognised to be the same species as the adult. An illustration of a half-grown example, 17mm. long and 13mm. high, is, therefore, here provided to assist identification.

One living shell was dredged, January 27th, 1914, from 120 fathoms, hard ground, in the Davis Sea, in South Lat. 66° 8′ and East Long. 94° 17′. Another and some odd valves, January 31st, 1914, from 110 fathoms, off the Shackleton Ice-shelf, in South Lat. 64° 32′ and East Long. 97° 20′.

Ptychocardia vanhoffeni *Thiele.*

Ptychocardia vanhoffeni Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 232, pl. xviii., fig. 24.

One right valve, 10mm. high, dredged, December 21st, 1913, in 55-60 fathoms, Commonwealth Bay.

Ptychocardia rudis *sp. nov.*

(Plate III., figs. 35, 36, 37.)

Shell rhombo-cordate, much inflated, thin, radially bicarinate, dorsal margin short, posterior truncate, ventral bisinuate, anterior projecting but with a median insinuation. Colour buff. Umbo prominent, incurved, polished. Lunule large, prominent, radially striated, limited by a wide and shallow furrow. Sculpture, the larger carina is median, projecting more than its posterior fellow, the whole valve overrun by sharp elevated threads separated by rather more than their interstices. Increasing by intercalation the threads amount at the margin to about 66. The interior is almost nacreous, ribbed by the impression of the external sculpture. Muscle scars invisible. Hinge with two small divergent cardinals in each valve. Height, 8; length, 6; breadth of conjoined valves, 6·5mm.

This species is a little shorter and more strongly featured than *P. vanhoffeni*, the median keel projects further and the radial threads are sharper and closer.

Ten specimens dredged, December 28th, 1913, in 288 fathoms, ooze, off the Mertz Glacier, Adelie Land, in South Lat, 66° 52′ and East Long. 145° 30′.

Pseudokellya stillwelli *sp. nov.*

(Plate III., figs. 38, 39.)

Shell small and frail, cordate-orbicular. Colour shading from pearl grey on the umbones to buff at the margins. The entire valve is sculptured by very close and very small radiating threads which increase in size as growth proceeds; at irregular intervals these are crossed by widely-spaced concentric growth lines. Ventral margin finely crenulated by the radial sculpture. The hinge has in the right valve one cardinal and one lateral and in the left two small cardinals and one lateral tooth. Height, 5·5; length, 5·5mm.

This is named in honour of Mr. F. L. Stillwell, a geologist of the Main Base party.

Judging from illustrations it is near to *P. cordiformis* Smith, but is narrower, more symmetrical, and with finer sculpture. It is evidently a smoother shell than *P. gradata* Thiele.

One valve and some fragments, December 28th, 1913, from 288 fathoms, ooze, off the Mertz Glacier, Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′. Another valve and fragments, January 27th, 1914, from 120 fathoms, hard ground, in the Davis Sea, in South Lat. 66° 8′ and East Long. 94° 17′.

Kellia nimrodiana *Hedley.*

Kellia nimrodiana Hedley, Brit. Antarct. Exped., ii., 1911, p. 4, pl. 1., figs. 1-4.

From Commonwealth Bay: two, September 4th, 1912, from 25 fathoms, and one, December 21st, 1913, from 55 to 60 fathoms.

Rochefortia charcoti *Lamy.*

Montaguia charcoti Lamy, Bull. Mus. Hist. Nat., xii., 1906, p. 46 ; *Id.*, Lamy, 1st Expéd. Antarct. Franç., Moll., 1906, p. 13, pl. i., figs. 13, 14.

Montaguia turqueti Lamy, Bull. Mus. Hist. Nat., xii., 1906, p. 47.

Tellimya charcoti Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 269.

Eight specimens, the largest 2mm. long, were caught in the web of a worm tube taken January 19th, 1912, at Aerial Cove, Macquarie Island, by Mr. H. Hamilton.

These correspond well to Dr. Lamy's figure of a species from Graham's Land on the opposite coast of Antarctica.

Two generic names have already been applied to this species. Reasons for discarding both and adopting *Rochefortia* are related by Dr. W. H. Dall, Trans. Wagn. Inst., iii., 1900, p. 1158.

Rochefortia macquariensis *sp. nov.*

(Plate IV., figs. 40, 41.)

Shell small, thin, rather inflated, inequilateral, the ventral and posterior margins rounded, the anterior more pointed. Colour white under a thin cream-coloured epidermis. Surface with a nacreous lustre, sculptured by very fine and close concentric threads. Length, 3·3 ; height, 2·7mm.

Three specimens from a worm tube collected January 19th, 1912, at Aerial Cove, Macquarie Island, by Mr. H. Hamilton.

This seems related to *Tellimya ovalis* Thiele, from the Davis Sea, but has a more prominent umbo and the anterior side more sharply produced.

Lasæa consanguinea *Smith.*

(Plate IV., figs. 42, 43, 44, 45, 46.)

Kellia consanguinea Smith, Phil. Trans. Roy. Soc., vol. 168, 1879, p. 184, pl. ix., fig. 20.

Lasæa miliaris var. Smith, Proc. Malac. Soc., iii., 1898, p. 23.

Lasæa consanguinea Melvill and Standen, Trans. Roy. Soc. Edinb., xlvi., 1907, p. 149 ; *Id.*, Lamy, Ann. Inst. Oceanograph, iii., 1911, p. 45 ; *Id.*, Thiele, Deutsch. Südpolar. Exped., xiii., 1912, p. 255, pl. xviii., fig. 14.

In 1898 Mr. Smith was inclined to reduce this form to a variety of *L. miliaris* Philippi, but Dr. Thiele has since refigured both to show the distinction in contour between them. As Mr. Smith wrote, " the dentition is a little different also," I have here figured the

hinge of a Macquarie Island specimen together with the hinge (figs. 45, 46) of *L. australis* from New South Wales for comparison. The habits of an allied, if not identical, species on St. Paul Island are described by Velain.*

Mr. H. Hamilton gathered this *Lascea* on Macquarie Island, on rocks between tide marks, associated with *Gaimardia pusilla*.

Chione mawsoni *sp. nov.*

(Plate IV., figs. 47, 48, 49, 50.)

Shell very solid, oblong ovate, umbo at about two-fifths of the length, varying both in contour, sculpture and colour. Externally the colour is a dull white, internally buff or a rich purple which may either stain the margin and the muscular impressions or be suffused over the whole interior. Sculpture ranging from a predominance of radial to a predominance of concentric lines. Usually the surface is comparatively smooth for a distance of about 12mm. from the umbo where it is engraved by about 120 fine, shallow, radiating grooves, parted by rather wider flat interspaces, crowded laterally and spaced medially. External to this area there may be a sudden change to coarse elevated, irregular, close-set, concentric cords, grouped by deeper furrows into bundles of four or five and each composed of an aggregate of smaller fibres. On the posterior dorsal region these cords rise higher. In another case the concentric sculpture in high relief is absent, the valve is comparatively smooth and radial striæ prevail over the whole disk.

Lunule long and narrow, limited by a deeply-incised groove. Sinus short, horizontal, and pointed. Length, 37; height, 29; depth of conjoined valves, 20mm. A second example is 40 × 32 × 19; and a third, 31 × 28 × 18.

Of Mr. H. Suter I inquired if this was the species from the Auckland Islands which he described as *Cytherea subsulcata*. He replied that the *C. subsulcata* differed by being more rounded with a more coarse sculpture which extended to the umbo, and that the Macquarie shell was new to him. *Venus antarctica* Velain, from St. Paul,† is a much rounder shell than this.

Twenty-six specimens were dredged, December 4th, 1913, in 14 fathoms, sandy bottom, in Lusitania Bay, Macquarie Island.

Saxicava antarctica *Philippi.*

(Plate IV., fig. 51, 52, 53.)

Saxicava antarctica Philippi, Archiv. f. Naturg., 1845, p. 52; *Id.*, Smith, Proc. Zool. Soc., 1881, p. 40; *Id.*, Martens and Pfeffer, Jahrb. Hamburg Wiss. Anst., iii., 1887, p. 113, pl. iv., fig. 2; *Id.*, Rochebrune, Miss. Scient. Cap Horn, Moll.,

* Velain.—Archiv. Zool. Expér., vi., 1878, p. 136. † Velain.—Arch. Zool. Expér., vi., 1878, p. 138, pl. v., figs. 21, 22.

1889, p. 102; *Id.*, Melvill and Standen, Journ. of Conch., ix., 1898, p. 105, and x., 1901, p. 47; *Id.*, Stempell, Zool. Jahrb. Suppl., iv., 1899, p. 240; *Id.*, Melvill and Standen, Trans. Roy. Soc. Edinb., xlvii., 1907, p. 151.

The form thus identified attains a length of 8mm. A dozen were found by Mr. H. Hamilton, at Macquarie Island; some among worm tubes and sand below low tide level in Garden Bay; some embedded in growing sponges below low tide level in Lusitania Bay; and a small pair attached to a worm tube in Aerial Cove.

Class AMPHINEURA.

Lepidopleurus kerguelenensis *Haddon.*

Leptochiton kerguelenensis Haddon, Chall. Rep. Zool., xv., 1886, p. 12, pl. i., fig. 3.

Leptochiton pagenstecheri Martens and Pfeffer, Jahrb. Hamburg Wiss. Anst., iii., 1887, p. 107, pl. iii., fig. 3.

Lepidopleurus kerguelenensis Pilsbry, Man. Conch., xiv., 1892, p. 12, pl. i., figs. 14-17; *Id.*, Thiele, Deutsch. Südpol. Exped., x., 1908, p. 9, and Deux. Expéd. Antarct. Franç., Moll., 1911, p. 33; *Id.*, Melvill and Standen, Trans. Roy. Soc. Edinb., xlviii., 1914, p. 343.

Six specimens, the largest 5mm. long, were taken on rocks at Macquarie Island by Mr. H. Hamilton.

Hemiarthrum setulosum *Dall.*

Chiton castaneus Gould, Am. Expl. Exped., xii., Moll., 1852, p. 326, pl. xxvii., figs. 4-11 (preoccupied by Wood, 1815, and by Quoy and Gaimard in 1834).

Hemiarthrum setulosum Dall, Bull. U.S. Nat. Mus., ii., 1876, p. 44, and iv., 1878, p. 314; *Id.*, Smith, Phil. Trans., vol. 168, 1879, p. 183; *Id.*, Haddon, Chall. Rep. Zool., xv., 1886, p. 14, pl. i., fig. 4, pl. ii., fig. 4; *Id.*, Martens and Pfeffer, Jahrb. Hamburg Wiss. Anst., iii., 1887, p. 108, pl. iii., fig. 4.

Acanthochiton couthouyi + *A. stygma* Rochebrune, Miss. Scient. Cap Horn, 1889, Moll., p. 133, pl. ix., fig. 2.

Hemiarthrum setulosum Pilsbry, Man. Conch., xiv., 1892, p. 20, pl. v.; *Id.*, Thiele, Deutsch. Tiefsee Exped., Bd. ix., 1906, p. 330, and Deutsch. Südpol. Exped., x., 1908, p. 11, pl. i., figs. 4-12, and Deux. Expéd. Antarct. Franç., Moll., 1911, p. 33; *Id.*, Lamy, Bull. Mus. Oceanograph., iii., 1911, p. 40; *Id.*, Melvill and Standen, Trans. Roy. Soc. Edinb., xlviii., 1914, p. 343; *Id.*, Bull. Mus. Hist. Nat., xxi., 1915, p. 68.

This small brown chiton was discovered in the Straits of Magellan, rediscovered at Kerguelen Island, and subsequently reported from New Georgia, South Orkneys, and Grahams Land. It now makes an appearance in the Australian Quadrant.

Two dozen were gathered, November 17th, 1912, by Mr. H. Hamilton, at the north end of Macquarie Island. He noted that the form was "abundant on rocks washed by the sea at low water."

Notochiton mirandus *Thiele.*

Notochiton mirandus Thiele, Deutsch. Tiefsee Exped., ix., 1906, p. 332, pl. xxix., figs. 11-16; *Id.*, Thiele, Deutsch. Südpol. Exped., Zool., x., 1908, p. 12.

Chætopleura miranda Smith, Nat. Antarct. Exped., ii., 1907, p. 1, pl. ii., figs. 13-13G.

Here the third valve is always entirely red, the largest of the series reaches a length of 120mm. One small specimen, December 31st, 1913, from 157 fathoms, ooze, in the D'Urville Sea, in South Lat. 66° 32′ and East Long. 141° 39′. Three large individuals, January 31st, 1914, from 110 fathoms, hard ground, off the Shackleton Ice-shelf, in South Lat. 64° 32′ and East Long. 97° 20′.

Callochiton gaussi *Thiele.*

Callochiton (*Icoplax*) *gaussi* Thiele, Deutsch. Südpol. Exped., x., 1908, p. 15, pl. i., figs. 27-32.

The series before me have the fourth valve always stained orange red. The largest individual attains a length of 22mm.

One, December 14th, 1913, from 45-50 fathoms; and seven, December 22nd, 1913, from 350-400 fathoms, both in Commonwealth Bay, Adelie Land. One, December 31st, 1913, from 157 fathoms, ooze, in the D'Urville Sea, in South Lat. 66° 32′ and East Long. 141° 39′. One, January 27th, 1914, in 120 fathoms, hard ground, in the Davis Sea, in South Lat. 66° 8′ and East Long. 94° 17′. One adhering to a valve of *Pecten colbecki*, January 29th, 1914, from 325 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 6′ and East Long. 96° 13′.

Plaxiphora aurea *Spalowsky.*

Chiton aureus Spalowsky, Prodr. Syst. Test., 1795, p. 88, pl. xiii., fig. 6; *Id.*, Pilsbry, "Nautilus," xxv., 1911, p. 36; *Id.*, Iredale, Trans. N.Z. Inst., xlvii., (1914) 1915, p. 424.

Chiton carmichaelis Wood, Index Test., 1828, Suppl., pl. i., fig. 10.

Chiton setiger King, Zool. Journ., v., 1831, p. 358.

Plaxiphora setigera Melvill and Standen, Journ. of Conch., x., 1901, p. 46, and Trans. Roy. Soc. Edinb., xlviii., 1912, p. 342.

Plaxifora campbelli Filhol, Compt. Rend., xci., 1880, p. 1095, and Miss. de l'ile Campbell, iii., 1885, p. 540; *Id.*, Iredale, Proc. Malac. Soc., ix., 1910, p. 95.

Chætopleura savatieri Rochebrune, Miss. Scient. Cap Horn, vi., 1889, p. 135, pl. ix., fig. 3. *C. hahni, id. op. cit.*, p. 136, pl. ix., fig. 4. *C. frigida, id. op. cit.*, p. 137, pl. ix., fig. 5.

Plaxiphora superba Pilsbry, Man. Conch., (1), xiv., 1893, p. 319, pl. lxviii., figs. 55-61 ; *Id.*, Suter, Man. N.Z. Moll., 1913, pp. 21, 1079 ; *Id.*, Thiele, Zool. Chun., 1909, heft. lvi., p. 27, pl. iii., figs. 39-40.

Plaxiphora subatrata Suter, Proc. Malac. Soc., ii., 1897, p. 190, text figs. 7-11, and Subantarctic Islands, N.Z., i., 1909, Moll., p. 3.

Plaxiphora aucklandica Suter, Subantarctic Islands, N.Z., i., 1909, p. 2, pl. i., fig. 1.

The intricate nomenclature of this species has been recently set out by Mr. Tom Iredale, who shows that this giant " has the longest synonymy of any austral chiton and is yet the best marked species." Continuity of its distribution from the Strait of Magellan and Cape Horn in the east to the southern islands of New Zealand in the west has been broken by the interposition of a frozen Antarctica. On Macquarie Island this enormous chiton seems to be generally abundant. Specimens are noted as collected, May, 1912, on rocks in littoral zone at Garden Bay, and again from the under surface of stones at low water near the north end. Some individuals preserved by Mr. H. Hamilton reach a length of 120mm.

Class GASTEROPODA.

Schismope subantarctica *sp. nov.*

(Plate V., figs. 54, 55.)

Shell minute, very oblique, imperforate. Colour white. Whorls three, first two coiled in one plane, the last rapidly enlarging and obliquely descending. Sculpture : spire smooth, base ornamented with spaced spiral ridges decussated by finer and closer radial threads. On the upper part of the body whorl this sculpture is faintly repeated. The perforation is small elliptical, its major axis parallel to the spiral, distant rather more than a quarter of a whorl from the aperture, to which a fine seam connects it. The margins are upraised. Posterior to the perforation is neither fasciole nor groove, which constitutes one of the peculiar features of the shell. The aperture is ovate and oblique, its inner lip appressed to the imperforate axis. Maj. diam., 1·15 ; height, 0·75mm.

One specimen, from a worm tube, collected January 19th, 1912, at Aerial Cove, Macquarie Island, by Mr. H. Hamilton.

S. mouchezi Velain (Archiv. Zool. Exper., vi., 1878, p. 119, pl. iv., figs. 7, 8) is equally minute but is rounder, more strongly sculptured, and has a deep furrow behind the perforation.

Puncturella analoga *Martens.*

Puncturella analoga Martens, Deutsch. Tiefsee Exped., vii., 1903, p. 70, pl. v., fig. 8.

There is a single shell, 6·5mm. long, agreeing generally with the figure quoted, which was dredged alive adhering to a *Brachiopod* from 60 fathoms, off the south end of Macquarie Island.

I have not material to discuss its relations with *P. falklandica* A. Adams,* with the southern form of *P. noachina* Linne,† or with *P. spirigera* Thiele.‡

Margarella macquariensis *sp. nov.*

(Plate V., figs. 56, 57.)

Shell depressed-spherical, rather solid, imperforate when adult, polished. Colour ash purple. Whorls four and a half, rather rapidly increased, well rounded at periphery, slightly descending at the last, parted by impressed sutures. Under the lens the surface, smooth to the eye, is seen to be sculptured by dense, fine, hair radials. Aperture oblique, semilunate, outer lip simple thin. Base tumid; in the young, till three whorls old, the shell is narrowly perforate, the umbilicus over-arched by a lobe of the columella lip, which later becomes appressed to the base. In the adult the basal axis is overspread by a thick crescentic callus, slightly tinged with green and excavate medially. Height, 8; maj. diam., 9; min. diam., 7·5mm.

Twenty specimens were taken, January 19th, 1913, by Mr. H. Hamilton, at Aerial Cove, Macquarie Island. He notes that the species occurred sparingly under stones. Compared with *M. expansa* Sowerby, this is smaller, more depressed, more solid, and of a paler colour.

Margarella refulgens *Smith.*

Valvatella refulgens Smith, Nat. Antarct. Exped., ii., 1907, p. 11, pl. ii., fig. 7; *Id.*, Hedley, Brit. Antarct. Exped., ii., 1911, Moll., p. 4.

Margarella refulgens Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 188; *Id.*, Smith, "Terra Nova" Exped., Zool., ii., 1915, p. 64.

Several, January 20th, 1913, dredged in 15-20 fathoms, Commonwealth Bay, on a floor of rock and brown algæ; again numerous specimens, September 4th, 1912, in 25 fathoms; five, December 14th, 1913, in 45-50 fathoms; two, December 21st, 1913, in 55-60 fathoms; and four, December 22nd, 1913, from 350-400 fathoms, in Commonwealth Bay. One, January 27th, 1914, in 120 fathoms, on a floor of granite rock, in the Davis Sea, in South Lat. 66° 8′ and East Long. 94° 17′.

---

* Dall.—Proc. U.S. Nat. Mus., xii., 1889, p. 356.

† Smith.—Proc. Malac. Soc., v., 1902, p. 165; *Id.*, Melvill and Standen, Trans. Roy. Soc. Edinb., xlviii., 1912, p. 344.

‡ Thiele.—Deutsch. Südpol. Exped., xiii., 1912, p. 186, pl. xi., figs. 4-10.

Submargarita crebrilirulata *Smith.*

Valvatella crebrilirulata Smith, Nat. Antarct. Exped., ii., 1907, Moll., p. 11, pl. ii., fig. 9 ;
Id., Hedley, Brit. Antarct. Exped., ii., 1911, Moll., p. 4.

Margarites crebrilirulata Smith, " Terra Nova " Exped., Zool., ii., 1915, p. 63.

The spiral threads of this species vary considerably in their development ; they may be normal on the early whorls and gradually disappear on the last, or the upper surface may be lirate and the base smooth. A large example is 10mm. in height.

From Commonwealth Bay : several dredged, January 20th, 1913, in 15-20 fathoms, on a floor of rock and brown algæ ; again numerous, September 3rd, 1912, in 25 fathoms ; nine, December 14th, 1913, in 45-50 fathoms ; and three from 55-60 fathoms. One specimen was taken in 3 fathoms in the Boat Harbour, Commonwealth Bay, by Dr. McLean, in 1913.

Submargarita smithiana *sp. nov.*

(Plate V., fig. 58.)

? Margarites sp. Smith, " Terra Nova " Exped., ii., Moll., 1915, p. 63.

Shell thin, turbinate, spire elevate, umbilicus narrow, deep, and spiral. Colour pale buff. Whorls about six, round and loosely coiled, parted by deep sutures. Sculpture : the surface is ornamented by raised spiral cords, which increase by intercalation and consequently vary in size, space, and number as growth proceeds. They extend from the suture to the aperture, are often crowded and irregular ; in one apparently adult individual they finally amount to about 30. But in a specimen of about five whorls there are only 15 cinguli, of which one on the shoulder, another at the periphery, and a third at the margin of the umbilicus are larger than the rest. A series of sharp elevated radial threads run obliquely backwards from the suture to the umbilicus ; these are evenly arranged about their own breadth apart and are as prominent on the summit of the cinguli as in the hollows between them. Aperture subcircular, entire, lightly attached to the preceding whorl, outer lip simple, columellar margin a little expanded. Height, 11 ; maj. diam., 12 ; min. diam., 9mm.

Six defective specimens were dredged, January 28th, 1914, in 240 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 20′ and East Long. 95° 27′.

From his description *S. smithiana* appears to be identical with an unnamed species taken by the " Terra Nova " Expedition, in 180-200 fathoms, in South Lat. 69° 43′ and East Long. 163° 24′. It is accordingly named as a tribute of respect to one who has done so much work on the Molluscan fauna of the Antarctic.

Minolia dulcis *Smith.*

Valvatella dulcis Smith, Nat. Antarct. Exped., ii., 1907, Moll., p. 10, pl. ii., fig. 8.

Margarites dulcis Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 190, pl. xi., fig. 21; *Id.*, Smith, "Terra Nova" Exped., Zool., ii., 1915, p. 63.

One, October 4th, 1912, from 25 fathoms; three, December 21st, 1913, from 55-60 fathoms; and three more, December 22nd, 1913, from 350-400 fathoms, in Commonwealth Bay. Two dredged, December 31st, 1913, from 157 fathoms, in the D'Urville Sea, in South Lat. 66° 32′ and East Long. 141° 39′.

Minolia thielei *sp. nov.*

(Plate V., fig. 59.)

? Margarites sp. Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 191, pl. xi., fig. 22.

Shell trochoidal, thin, lustrous, narrowly umbilicate, bicarinate. Apex tilted, white, opaque, mamillate, punctate. Remainder of the shell translucent, pearly with a green and purple lustre. Whorls four, parted by a suture which lies in a deep gutter. Sculpture: the spirals, which increase by intercalation, finally amount in my larger specimen to 33, of which two on the periphery are larger than the rest, and 20 on the base are small and close-set. On the penultimate the spirals are six, and on the antipenultimate four. Only the interior of the umbilicus has no spirals. Everywhere very delicate radial threads traverse the flat interstices; but on two or three of the innermost spirals these enlarge and denticulate the crest of the rib. Aperture subcircular, the columella margin a little expanded, a slight glaze of callus over the preceding whorl and with the outer lip sharply dentate by the external sculpture. Height, 8; maj. diam., 9; min. diam., 7mm.

One specimen (type) dredged, January 31st, 1914, in 110 fathoms, hard ground, near the Shackleton Ice-shelf, in South Lat. 64° 32′ and East Long. 97° 20′. Another smaller specimen taken December 28th, 1913, in 288 fathoms, off the Mertz Glacier Tongue, in South Lat. 66° 55′ and East Long. 145° 21′.

Save that our species is bicarinate it resembles the unnamed "Gauss" fragment figured by Dr. Thiele, after whom, in appreciation of his admirable work on Antarctic Mollusca, it is now called.

Thoristella aucklandica *Smith.*

Calliostoma aucklandicum Smith, "Southern Cross" Collections, 1902, p. 207, pl. xxiv., fig. 5.

Thoristella aucklandica Iredale, Trans. N.Z. Inst., xlvii., (1914) 1915, p. 436.

Twelve specimens, June 28th, 1912, from 1 fathom, Carnley Harbour, Auckland Islands. This species seems to be related generically to *Calliostoma retiarium* Hedley and May, from South Tasmania.

Photinula capillacea *Philippi.*

var. minor *Smith.*

Trochus capillaceus Philippi, Zeit fur Malak., iv., 1848, p. 102.

Cantharidus pruinus Gould var. *minor* Smith, Coll. "Southern Cross," 1902, p. 207.

One specimen, June 28th, 1912, from 1 fathom, Carnley Harbour, Auckland Islands.

Photinula coruscans *sp. nov.*

(Plate V., figs. 60, 61.)

Cantharidus pruninus var. *perobtusa* Suter, Proc. Malac. Soc., ii., 1897, p. 269; *Id.*, Man. N.Z. Mollusca, 1913, p. 125, pl. xxxix., fig. 6.

Shell globose-conic, thin, light and imperforate. Colour a leaden purple which, on the apex, changes to bright rose, basal callus white with a narrow outer border of wine purple. Whorls six, rapidly increasing, wound obliquely, last descending a little and broadened behind the aperture. Sculpture: to the eye the surface is smooth and glossy, but under the lens appears densely and finely spirally scored by grooves which extend uniformly across the whorl. On the third whorl are five grooves which subsequently decrease in size but multiply greatly in number, and on the last whorl are crossed by delicate growth lines. The centre of the base is occupied by a thick callus overflowing from the columella margin. Aperture oblique, subcircular, outer lip simple thin. Between the insertions the previous whorl is first eroded and then smeared with a nacreous film. Within the outer lip is a narrow space coloured like the exterior and followed by a broader pale and dull zone. Further within the throat is brilliantly nacreous with opaline reflections of rose, mauve, and emerald. It is finely fluted by spirals independent of the external sculpture. Height, 21; maj. diam., 23; min. diam., 19mm.

Ten specimens were obtained at the north end of Macquarie Island, but there is no note as to their precise situation. Their wide aperture and thin shell suggests that they may live clinging to the seaweed.

As this shell seemed to me not to conform to the representation of *Cantharidus pruinus* var. *perobtusus*, with which Mr. Suter had identified it, I asked Dr. Pilsbry to compare a Macquarie Island shell with the type of his *perobtusus*. He replied, November 23rd, 1915, that *perobtusus* was founded on a single specimen, the locality of which is still unknown; it has an axial pad larger than *coruscans*, and the last whorl is noticeably concave above. He considers that, if the shell I sent was adult, the two are specifically distinct, although he would rank *coruscans* as closer to *perobtusus* than that is to *pruinus*. He agrees that *Photinula* may include these.

On the upper surface the animal of *P. coruscans* is black, and on the under cream. Just above the tip of the tail the epipodium commences and continues without interruption to the ocular tentacles. The hinder part is a thick crest, tuberculate at the edge where three pairs of epipodial tentacles arise from sheaths. Two of these tentacles are beside and one in front of the operculum. Anterior to this latter, the epipodium changes to a thin free cervical lobe hanging loose over the foot and bound to the ocular tentacle for almost its full length. This cervical lobe has a simple unfringed margin on both left and right sides, and on each side it conceals a cervical papilla. Under the right ocular tentacle is another projection, apparently the cephalic organ. On the muzzle are two free lobes which do not meet in the centre but ascend on either side to form a sinus around the cephalic tentacle and junction with the ocular tentacle.

Radiacmea macquariensis *sp. nov.*

(Plate VI., figs. 62, 63.)

Shell small, rather solid, oblong-ovate, moderately elevated, apex in front of the centre. Colour: one specimen is purple pink with dark and light concentric zones; another is white with chocolate zones and pink apex, interior pale mauve. Sculpture: about 60 depressed radial riblets parted by narrow grooves which notch the margin. Both riblets and interstices are crossed by fine and dense concentric threads. External sculpture imprinted on the interior surface, muscle-scars definite. A narrow margin to the inner lip is not covered by a callus sheet extending over the rest of the interior. Length, 12; breadth, 9·5; height, 5mm.

Four specimens were collected on rocks at Macquarie Island by Mr. H. Hamilton.

Nearest to this seems to be *R. campbelli* Filhol, from Campbell Island, which is smaller, rounder, and less solid.

Lepeta coppingeri *Smith.*

Lepeta coppingeri Smith, Proc. Zool. Soc., 1881, p. 35, pl. iv., fig. 12; *Id.*, Pilsbry, Man. of Conch., xiii., 1891, p. 71, pl. xxxix., figs. 20, 21; *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, pp. 185, 233, and 257; *Id.*, Smith, "Terra Nova" Exped. Zool., ii., 1915, p. 62.

Pilidium coppingeri Strebel, Zool. Jahrb. Syst., xxv., 1907, p. 110, pl. iii., fig. 38; *Id.*, Schwed. Südpol. Exped., vi., 1908, p. 83.

Lepeta antarctica Smith, Nat. Antarct. Exped., ii., 1907, Moll., p. 12, pl. ii., fig. 11; *Id.*, Hedley, Brit. Antarct. Exped., ii., 1911, Moll., p. 3.

? Patella emarginuloides Philippi, Malak. Blatt., xv., 1868, p. 224.

A series from Adelie Land ranges from small specimens like the type of *L. antarctica* to one 13mm. long, 6mm. high, and 9·5mm. broad. In the adult, the anterior slope is more gradual, the radial sculpture is comparatively weaker and the scales thereon disappear. Sometimes the interior is of a bright orange colour.

Dr. Thiele has united the southern *L. antarctica* to the *L. coppingeri* from Magellan Straits, a connection recently accepted by the author of these names.

From Commonwealth Bay the expedition brought numerous examples, September 3rd, 1912, from 25 fathoms; seven, December 14th, 1913, from 45-50 fathoms; and four more, December 21st, 1913, from 55-60 fathoms.

Lepeta depressa *sp. nov.*

(Plate VI., fig. 64.)

Shell thin and delicate, very depressed, elongate-ovate. Colour, uniform drab. Apex at one-third of the length. Sculpture: anterior end faintly rayed, sides and posterior end decorated with about 40 radiating raised lines which at the sides curve forwards and downwards. These radials are widely spaced by flat interstices. As growth proceeds fresh radials are intercalated. Fine concentric hair lines override both radials and interstices. Height, 3·5mm.; length of spm., 13mm.; probable length when entire, 16mm.; breadth actually, 9mm., probably 10mm. when complete.

This very distinct species is represented by a single broken shell, dredged January 28th, 1914, from 240 fathoms, bottom ooze, off the Shackleton Ice-shelf, in South Lat. 65° 20′ and East Long. 95° 27′.

Nacella delesserti *Philippi.*

(Plate VI., figs. 65, 66, 67, 68, 69.)

Patella delesserti Philippi, Abbild. Besch., iii., 1849, p. 9, pl. i., fig. 5.

Patella redimiculum Reeve, Conch. Icon., viii., 1854, pl. xx., fig. 50.

? Patella strigilis Hombron and Jacquinot, Ann. Sci. Nat., (2), xvi., 1841, p. 190.

The identification of southern limpets is not an easy task, as might be inferred from their intricate synonymy. It is probable that the species fixed on the kelp are always distinct from those living on the rock. Young shells are not readily matched with old without an extensive series.

A limpet found by Mr. H. Hamilton to be generally distributed on rocks in the littoral zone of Macquarie Island thus changes in its development. The young shell is proportionately narrower than the adult and has the apex more excentric. Philippi's drawing of a limpet from Marion Island, 22mm. long, is intermediate in these respects between a young Macquarie Island shell, 12mm. long (fig. 67), and a more mature Macquarie Island individual, 53mm. long (fig. 65). The Marion Island species has been buried in the synonymy of different other species by subsequent writers.

*Nacella illuminata** has been reported from Macquarie Island but does not occur in this collection. Our shells differ from Gould's figure of that Auckland Island species by being narrower with finer and more numerous ribs, lower and less excentric apex, and different colour pattern.

Patella depsta Reeve, from St. Paul, as figured by Velain,† and which also appears to be a *Nacella*, differs by still finer radial sculpture.

In alcohol, the animal (pl. vi., fig. 68) is buff. On the mantle margin is an uninterrupted linear series of simple papillæ, every fourth (but sometimes every second) one of which is black, larger, and much contracted. These are more developed than in other genera of limpets. For comparison, a drawing of the animal (fig. 69) of *Cellana variegata* Blainville, from life, is here submitted. Within the papillæ are set the branchial lamellæ, continuous but diminished in front. For comparison, a sketch is here added of *Patella squamifera* Reeve (text fig. 2), a Sydney specimen, from life, to show the continuous row as expressed in another genus which has no pedal fringe.

Fig. 2.

The foot of the *Nacella* is large and muscular with a double margin in front. Half way up the stem is a broad undulating fringe above which the skin is more smooth and tender, thus suggesting that the flounce round the foot meets the mantle edge to form a branchial chamber. If the pedal fringe of *Nacella* be the homologue of the epipodial skirt of the Trochidæ, then this genus may be nearer than other limpets to the primitive Diotocardian stock. Davis and Fleure remarked that, as a rudimentary and transient feature, this fringe occurs in the young of *Patella vulgata*.‡

If I have correctly identified this species it has only been described from immature specimens. The adult may be characterised as follows :—Shell large, solid and elevated ; of variable shape, the apex being usually one-fourth of the total length from the anterior end, but varying from one-third to one-sixth, height usually less than one-half the breadth. Colour, externally chestnut variegated with tawny olive ; interior nacreous,

* Suter.—Subantarct. Islands of N. Zeal., i., 1909, p. 6.

† Velain.—Arch. Zool. Expér., vi., 1878, pl. iv., figs. 13-18. ‡ Davis and Fleure.—L.M.B.C. Memoirs, x., 1903, p. 15

bluish silver mottled with horn brown streaks, the latter being more opaque in transmitted light than the background, muscle print a porcellanous callus, ashen and sharply defined. Sculpture: from 30 to 40 low crowded radial ribs increasing by splitting; these faintly denticulate the margin. Well preserved specimens show a concentric ornament of fine dense hair lines, among which are irregularly interposed more prominent cords which sometimes form vaulted scales on the ribs. Aperture ovate, usually broader behind the apex.

A shell here figured is 52mm. long, 40mm. broad, 21mm. high. Another is 62 × 49 × 21mm., and another 61 × 49 × 31. The young shell figured (fig. 67) is 12mm. long, 8mm. broad, 3mm. high.

Nacella kerguelenensis *Smith.*

Patella ferruginea Reeve (not Gmelin), Conch. Icon., viii., 1854, pl. xvii., fig. 40.

Patinella magellanica Dall, Bull. U.S. Nat. Mus., iii., 1876, p. 43.

Patella kerguelenensis Smith, Phil. Trans., vol. 168, 1879, p. 177, pl. ix., fig. 13; *Id.*, Studer, Archiv. Naturg., xlv., 1879, p. 128; *Id.*, Watson, Chall. Rep. Zool., xv., 1886, p. 27.

Nacella kerguelenensis Pilsbry, Man. Conch., xiii., 1891, p. 121, pl. xliii., figs. 7, 8; *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 234; *Id.*, Lamy, Bull. Mus. Hist. Nat., xxi., 1915, p. 73.

Patinella kerguelenensis Strebel, Zool. Jahrb. Syst., xxv., 1907, p. 153, pl. iv., fig. 58.

Until Dr. H. Strebel found this in the Magellan province it had not been noted beyond Heard and Kerguelen Islands. Possibly masses of floating kelp, so common in these seas, afford it a means of dispersal. Mr. H. Hamilton collected, on Macquarie Island, four beach-worn shells, one of which measured, length, 83; breadth, 68; and height, 48mm. The best preserved of these was a dark copper-brown inside and the most aged were contracted anteriorly in a snout, but broadly rounded behind. The apex was well in front of the centre. All agreed generally with specimens from Kerguelen Island determined by Mr. E. A. Smith.

Brookula *sp.*

(Plate VI., fig. 70.)

Shell minute, turbinate, widely umbilicate. Whorls two and a half, rounded, scarcely in contact, the apex with a half turned over tip. Colour white. Aperture entire, circular, lip simple. Maj. diam., 0·8; min. diam., 0·6; height, 0·6mm.

Two eroded and probably immature specimens were collected, January 19th, 1912, by Mr. H. Hamilton, on worm tubes, at Aerial Cove, Macquarie Island. As the original surface was mostly etched away it seems best not to give a specific name to a form in

which differential characters are so obscure. *Brookula*, introduced by Iredale in 1912 (Proc. Malac. Soc., x., p. 219), will cover such Antarctic forms as *Cyclostrema decussatum* Pelseneer (Expéd. Antarct. Belge. Moll., 1903, p. 19., pl. v., fig. 48).

Lævilitorina antarctica *Smith.*

(Plate VI., figs. 71, 72.)

Paludestrina antarctica Smith, Coll. "Southern Cross," Moll., 1902, p. 204, pl. xxiv., fig. 16.

Lævilitorina antarctica Lamy, 2nd Expéd. Antarct. Franç., 1911, Moll., p. 9.

A *Lævilitorina*, which seems common in shallow water in Adelie Land, answers in its younger stages to that figured by Mr. E. A. Smith, from Cape Adare. But when full grown the species before me expands at the last whorl, the aperture is freed from the previous whorl, and a small umbilicus is formed. This adult is, however, no longer than the Cape Adare type. I have concluded that the shells now figured represent the immature and adult of a small form of *L. antarctica*.

Several specimens dredged May 21st, 1912, and June 1st, 1912, in 3 fathoms, among rhizoids of brown algæ, Boat Harbour, Commonwealth Bay; and again, October 4th, 1912, from 25 fathoms, Commonwealth Bay. A specimen was also taken from the stomach of a fish, *Harpagifer bispinus*.

Lævilitorina caliginosa *Gould.*

Littorina caliginosa Gould, Proc. Bost. Soc. Nat. Hist., iii., 1849, p. 83; *Id.*, Gould, U.S. Expl. Exped., xii., Moll., 1852, p. 198, pl. xiv., fig. 240.

Hydrobia caliginosa Smith, Phil. Trans. Roy. Soc., vol. 168, 1879, p. 173, pl. ix., fig. 8; *Id.*, Studer, Archiv. Naturgesch, xlv., 1879, p. 129; *Id.*, Watson, Chall. Rep. Zool., xv., 1886, p. 613.

Lævilitorina caliginosa Martens and Pfeffer, Jahrb. Hamburg. Wiss. Anst., iii., 1886, p. 81, pl. i., fig. 8.

Paludestrina caliginosa Smith, Proc. Malac. Soc., iii., 1898, p. 22.

Lævilitorina caliginosa Pelseneer, Moll. "Belgica" Exped., 1903, p. 8; *Id.*, Lamy, Bull. Mus. Hist. Nat., xii., 1906, p. 112, and xxi., 1915, p. 71; *Id.*, Lamy, 1st Expéd. Antarct. Franç., Moll., 1906, p. 4; *Id.*, Strebel, Zool. Jahrb. Syst., xxv., 1907, p. 156; *Id.*, Strebel, Schwed. Südpol. Exped., vi., 1908, p. 51; *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 235, pl. xiv., fig. 25; *Id.*, Suter, Manual N.Z. Moll., 1913, p. 190, pl. xxxv., fig. 11.

About 60 specimens of this were gathered, March 23rd, 1912, by Mr. H. Hamilton, at Hassellborough Bay, Macquarie Island. In his notes he remarked on it as "a small brown variety, attaches itself to rocks or algæ, exceedingly common on the coast."

Lævilitorina hamiltoni *Smith.*

(Plate VI., fig. 73.)

Paludestrina hamiltoni Smith, Proc. Malac. Soc., iii., 1898, p. 22, figs. 1, 2.

Lævilitorina hamiltoni Suter, Man. N.Z. Moll., 1913, p. 190, pl. xxxv., fig. 12.

A hundred specimens were gathered, October 28th, 1913, by Mr. H. Hamilton, attached to algæ at low water on the west coast; and again, March 23rd, 1912, at Hassellborough Bay, Macquarie Island, where it clung firmly to several pieces of algæ between tide marks.

Eatoniella kerguelenensis *Smith.*

Eatonia kerguelenensis Smith, Ann. Mag. Nat. Hist., (4), xvi., 1875, p. 70.

Eatoniella kerguelenensis (and *? E. inflata*) Dall, Bull, U.S. Nat. Mus., iii., 1876, p. 42; *Id.*, Smith, Phil. Trans., clxviii., 1879, p. 174, pl. ix., fig. 10; *Id.*, Martens and Pfeffer, Jahrb. Hamburg. Wiss. Anst., iii., 1886, p. 94, pl. ii., fig. 5; *Id.*, Lamy, 1st Expéd. Antarct. Franç., 1906, Moll., p. 7; *Id.*, Melvill and Standen, Trans. Roy. Soc. Edinb., xlvi., 1907, p. 134, and xlviii., 1912, p. 351; *Id.*, "Scotia" Zool., vi., 1912, p. 125; *Id.*, Strebel, Schwed. Südpol. Exped., vi., 1908, p. 58, pl. iv., fig. 58; *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 235, pl. xiv., fig. 26, pl. xvi., fig. 1.

Forty specimens, October 4th, 1912, from 25 fathoms; and nine from 45-50 fathoms, Commonwealth Bay.

Eatoniopsis ainsworthi *sp. nov.*

(Plate VII., fig. 74.)

Shell small, oblong-ovate, imperforate. Colour, olive buff. Whorls five, rounded, rather rapidly increasing, parted by impressed sutures. Sculpture: smooth save for slight and irregular growth lines. Aperture subcircular, lip a little expanded and everted. Height, 1·5; breadth, 0·7mm.

Twelve specimens were taken from a worm tube collected, January 19th, 1912, by Mr. H. Hamilton, at Aerial Cove, Macquarie Island. Named in honor of Mr. G. F. Ainsworth, who was in charge of Macquarie Island for two years.

Tatea melvilli *sp. nov.*

(Plate VII., fig. 75.)

Shell elongate-conical, smooth, rimate. Colour, ochraceous buff. Whorls five, rounded, parted by impressed sutures, latterly rapidly increasing so that the last is longer than the rest together. Sculpture: on the last whorl are a few lightly impressed

indefinite furrows. Aperture entire, ovate, angled above, rounded below, outer lip simple, slightly everted, inner lip separated by a narrow crack from the preceding whorl. Length, 2·7 ; breadth, 1mm.

This species is called after Mr. James Cosmo Melvill, the senior author of a valuable report on the Antarctic Mollusca of the "Scotia" Expedition, so often quoted in these pages.

A dozen specimens were obtained, March 17th, 1912, at Garden Bay, Macquarie Island, by Mr. H. Hamilton, who notes that it was "common under stones, above ordinary high-water level, but close to the sea".

Ovirissoa *gen. nov.*

The southern shells usually included under *Rissoa* were recently discussed by Mr. T. Iredale,* who shows that this generic name is not applicable, and offers, instead, several new divisions and names. The polar species were not included in his scheme. So *Ovirissoa*, typified by *Rissoa adarensis* Smith, is proposed for a group from Antarctic waters of milk-white, glossy, imperforate, rather elongate small shells with about five convex whorls and an entire aperture.

Other species of *Ovirissoa* are *O. cazini* Velain, from St. Paul's Island ; *O. columna* Pelseneer, from Charcot Land ; and *O. georgiana* Pfeffer, from South Georgia.

Ovirissoa adarensis *Smith.*

Rissoa adarensis Smith, Coll. "Southern Cross," 1902, p. 205, pl. xxiv., fig. 17 ; *Id.*, Smith, Nat. Antarct. Exped., ii., 1907, p. 8, pl. ii., fig. 2 ; *Id.*, Melvill and Standen, Trans. Roy. Soc. Edinb., xlvi., 1907, p. 132 ; *Id.*, "Scotia" Zool., v. 1907, p. 102 ; *Id.*, Lamy, 2nd Expéd. Antarct. Franç., ii., 1911, Moll., p. 10 ; *Id.*, Hedley, Brit. Antarct. Exped., ii., 1911, p. 5 ; *Id.*, Smith, "Terra Nova" Exped., Zool., ii., 1915, p. 65.

Six specimens were dredged, September 3rd, 1912, from 25 fathoms, in Commonwealth Bay.

Subonoba bickertoni *sp. nov.*

(Plate VII., fig. 76.)

Shell elongate-ovate, imperforate. Colour, uniform light brown. Whorls five, wound rather obliquely with impressed sutures. Sculpture : very delicate wide-spaced spiral threads. Aperture oblique, elliptical, lip slightly everted, in contact with the body whorl for a short space only. Length, 2·7 ; breadth, 1·3mm.

One specimen (type) dredged, December 14th, 1913, in 45-50 fathoms, in Commonwealth Bay. Fifty, September 3rd, 1912, from 25 fathoms, Commonwealth Bay.

* Iredale.—Trans. N.Z. Inst., xlvii., 1915, p. 447.

By colour and sculpture it is distinguished from *R. adarensis* which it resembles in form. From the figure *R. fraudulenta* seems a stouter shell. It is named in honour of Mr. F. H. Bickerton, F.R.G.S., who spent two years at the Main Base, Commonwealth Bay.

Subonoba deserta *Smith.*

Rissoa deserta Smith, Nat. Antarct. Exped., ii., 1907, p. 9, pl. ii., fig. 1 ; *Id.*, Melvill and Standen, Trans. Roy. Soc. Edinb., xlviii., 1912, p. 349 ; *Id.*, Scotia Zool., vi., 1912, p. 123 ; *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 194, pl. xi., fig. 33.

A dozen examples of this featureless shell occurred, September 3rd, 1912, and six, December 14th, 1913, in 45-50 fathoms, Commonwealth Bay.

Subonoba gelida *Smith.*

Rissoa gelida Smith, Nat. Antarct. Exped., ii., 1907, Moll., p. 9, pl. ii., fig. 5 ; *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 195, pl. xi., figs. 37, 38 ; *Id.*, Smith, " Terra Nova " Exped., ii., Moll., 1915, p. 65.

Fifty specimens dredged, September 3rd, 1912, from 25 fathoms; and nine, December 14th, 1913, from 45-50 fathoms, Commonwealth Bay.

Subonoba glacialis *Smith.*

Rissoa glacialis Smith, Nat Antarct. Exped., ii., 1907, Moll., p. 9, pl. ii., fig. 4 ; *Id.*, Hedley, Brit. Antarct. Exped., ii., 1911, Moll., p. 5 ; *Id.*, Smith, " Terra Nova " Exped., ii., Moll., 1915, p. 65.

Two specimens dredged, September 3rd, 1912, from 25 fathoms ; and three, December 14th, 1913, from 45-50 fathoms, in Commonwealth Bay.

Subonoba ovata *Thiele.*

Rissoa ovata Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 194, pl. xi., fig. 36.

One, October 4th, 1912, from 25 fathoms, in Commonwealth Bay.

Subonoba wilkesiana *sp. nov.*

(Plate VII., fig. 77.)

Shell broad-ovate, subperforate. Colour buff. Whorls three and a half, inflated, constricted at the suture. Sculpture : close, fine, spiral threads evenly distributed and irregularly decussated by slight growth lines. Aperture subquadrate, entire columella margin a little reflected. Length, 2·5 ; breadth, 1·8mm.

One specimen, December 14th, 1913, from 45-50 fathoms, in Commonwealth Bay.

This appears to be a broader shell than the related *Rissoa subantarctica* Thiele, from Kerguelen. It is named in honour of Capt. Charles Wilkes, who made a daring reconnaissance in these waters in 1840.

Cerithiopsilla antarctica *Smith.*

Lovenella antarctica Smith, Nat. Antarct. Exped., ii., 1907, Moll., p. 10, pl. ii., fig. 6.

Cerithiopsilla antarctica Thiele, Deutsch. Südpol. Exped., xiii., 1912, pp. 202, 261; *Id.*, Hedley, Brit. Antarct. Exped., ii., 1911, p. 5; *Id.*, Smith, "Terra Nova" Exped., ii., Moll., 1915, p. 70.

A single worn specimen, September 3rd, 1912, from 25 fathoms, Commonwealth Bay.

Eumeta strebeli *Thiele.*

(Plate VII., fig. 78.)

Eumeta strebeli Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 203, pl. xii., fig. 25.

One dredged, December 14th, 1913, in 45-50 fathoms, in Commonwealth Bay.

Our example is more mature than the single specimen taken by the "Gauss" Expedition, having 11 whorls in a length of 10mm. The radial sculpture gradually vanishes on the latter whorls which have three sharp peripheral cords and a rather flat base. Their glossy surface is engraved with dense microscopic spiral striæ.

Melanella exulata *Smith.*

Eulima exulata Smith, "Terra Nova" Exped., ii., Moll., 1915, p. 64, pl. i., fig. 2.

A single immature example having eight whorls in a length of 66mm., dredged December 14th, 1913, in 45-50 fathoms; and a still smaller one, December 22nd, 1913, from 350-400 fathoms, both in Commonwealth Bay.

Melanella laseroni *sp. nov.*

(Plate VII., fig. 79.)

Shell small, subcylindrical, slightly curved axially, smooth, glossy, and colourless. Apex blunt. Whorls eight, the base of the preceding whorl seen through the transparent shell traces a marginal band above the suture. Aperture pyriform, very oblique, outer lip thin, curving forward in front of the insertion, rounded below, columella straight. Length, 4·75; breadth, 1·4mm.

Four, including the type, October 4th, 1912, from 25 fathoms, Commonwealth Bay. The Australian *M. commensalis* Tate, is somewhat like this species, but is broader on the last whorl.

Named in honour of Mr. C. F. Laseron, who did excellent scientific work for the expedition.

Stilifer polaris *sp. nov.*

(Plate VII., fig. 80.)

Shell conic-acuminate, thin, translucent, spire gradate, tapering to an attenuate mucronate apex. Whorls nine, mostly flattened at the suture and rounded at the periphery, last subglobose. Colour milk-white. Surface very glossy, narrow and faint spiral grooves are crossed by fine radiating hair lines. Aperture reniform, columella perpendicular, thickened and reflected, outer lip forwardly sinuate, thin-edged, anterior margin round and slightly everted, no callus on inner lip. Length, 10; breadth, 6mm.

This form is related to *S. petterdi* Tate and May,* from which the slender spire readily distinguishes it. There is no information as to its occurrence, but it is probably parasitic on some echinoid.

A single specimen with the animal complete, January 29th, 1914, from 325 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 6′ and East Long. 96° 13′.

Trichotropis antarctica *Thiele.*

Trichotropis antarctica Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 197, pl. xii., fig. 6, pl. xv., fig. 21; *Id.*, Smith, "Terra Nova" Exped., ii., Moll., 1915, p. 67, pl. i., fig. 6.

Four, December 28th, 1913, from 288 fathoms, off the Mertz Glacier, Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′.

Trichoconcha mirabilis *Smith.*

Trichoconcha mirabilis Smith, Nat. Antarct. Exped., ii., 1907, Moll., p. 6, pl. i., figs. 7, 7B.

Torellia mirabilis Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 197; *Id.*, Smith, "Terra Nova" Exped., ii., Moll., 1915, p. 68.

When dried the shell of this species crumpled and collapsed like that of some New Zealand *Paryphanta*. The extremes of distribution previously recorded are connected by the Mawson Expedition thus—

One, December 31st, 1913, from 157 fathoms, ooze, off the Mertz Glacier Tongue, Adelie Land, in South Lat. 66° 32′ and East Long. 141° 39′. Eight, December 22nd,

* Tate and May.—Trans. Roy. Soc. S.A., xxiv., 1900, p. 97.

1913, from 350-400 fathoms, ooze, in Commonwealth Bay, Adelie Land, in South Lat. 66° 50′ and East Long. 142° 6′. Four, January 21st, 1914, from 60 fathoms, bottom stones and red algæ, off Drygalski Island, in South Lat. 65° 42′ and East Long. 92° 10′.

Trochaclis antarctica *Thiele.*

Trochaclis antarctica Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 192, pl. xi., fig. 29.

Two specimens, January 28th, 1914, from 240 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 20′ and East Long. 95° 27′.

Friginatica *gen. nov.*

Examination of naticoid systematics induced Dr. W. H. Dall * to adopt Gray's division by shelly and horny opercula. In the first case he selected *Nerita vitellus* Linne (which Hanley identified with *N. rufa* Born), as type of *Natica* of Scopoli, thus restricting that genus to shells with a concentrically furrowed operculum. Those which have a single marginal sulcus on the operculum were referred to *Cochlis* Bolten, with *N. vittata* as type; finally a group *Cryptonatica*, type *N. clausa*, was formed for species with a smooth operculum.

Naticoids wearing a horny operculum were then grouped into *Polinices* with *Nerita mammilla* Linne as type, *Euspira* with *Natica labellata* as type and *Cepatia* with *Natica cepacea* as type.

The Linnean *Nerita mammilla* is a compound, perhaps indistinguishable, species, given different values by various authors, but which Hanley and Watson recognise as *Natica pyriformis* Recluz = *Mammillaria tumida* Swainson. It appears from his illustration that Montfort regarded *N. mammilla* as a species like the West American *N. uber* Valenciennes. So that the oriental group usually considered as *Polinices* might, strictly in subdivision, be termed *Mammillaria*.

There is an Antarctic naticoid group which cannot be received by any of the above, or by other known extralimital groups such as *Cernina* or *Mammilla*, not discussed by Dr. Dall. So far this amounts to about a dozen rather featureless species, all small, mostly uniform olive buff in colour, four whorls, a slightly raised spire, a caducous epidermis, comparatively thin, unsculptured, except for incremental striæ, without umbilical funicle or a callus pad at the insertion of the right lip. Operculum corneous paucispiral.

As type of *Friginatica*, I nominate *Natica beddomei* Johnston, well figured in the *Gasteropoda* of the "Challenger" under the later name of *Natica effosa* Watson, and, perhaps, identical with a Tertiary fossil *Natica polita* Ten. Woods.

* Dall.—U.S. Geol. Survey Profess. Papers, 59, 1909, p. 85.

Friginatica pisum *sp. nov.*

(Plate VII., fig. 81.)

Shell imperforate, globose, small, thin diaphanous. Colour, pale olive buff; there are faint spiral lines apparently in the substance rather than on the surface. Spire elevated. Whorls apparently four, but the apex is eroded, rounded, parted by deeply impressed sutures. Aperture narrowly semilunate, outer lip simple thin, margins united by a thin callus, columella perpendicular, thickened and reflected, spreading a small lobe over the axis. Height, 3·5; diameter, 3·5mm.

One specimen, containing the animal, from Lusitania Bay, Macquarie Island. With this was the young of a larger *Friginatica* like *F. grisea* but imperforate.

Friginatica grisea *von Martens.*

Natica grisea von Martens, Sitz. Gesell. Naturf. Freunde Berlin, 1878, p. 24; *Id.*, Watson, "Chall." Rep. Zool., xv., 1886, p. 432, pl. xxviii., fig. 5; *Id.*, von Martens, Deutsch. Tiefsee Exped., vii., 1903, p. 64, pl. iv., fig. 2; *Id.*, Strebel, Zool. Jahrb. Syst., xxiv., 1906, p. 143, xxv., 1907, p. 176; *Id.*, Strebel, Schwed. Südpol. Exped., vi., 1908, p. 61, pl. v., fig. 66; *Id.*, Hedley, Brit. Antarct. Exped., ii., 1911, p. 7; *Id.*, Smith, "Terra Nova" Exped., ii., Moll., 1915, p. 69.

Natica delicatula Smith, Collect. "Southern Cross," 1902, p. 206, pl. xxiv., fig. 6; *Id.*, Nat. Antarct. Exped., ii., 1907, Moll., p. 5; *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 199, pl. xii., fig. 16.

This species apparently becomes narrower in proportion to length as growth proceeds, for specimens here examined (9mm. long) are intermediate, both in size and proportions, between individuals figured by Watson and by Smith. In accordance with a suggestion by the latter author they are now referred to *N. grisea.*

Four were taken, September 3rd, 1912, in 25 fathoms, Commonwealth Bay; and three, January 28th, 1914, in 240 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 20′ and East Long. 95° 27′.

Pellilitorina rossiana *Smith.*

Amauropsis (?) *rossiana* Smith, Nat. Antarct. Exped., ii., 1907, Moll., p. 5, pl. i., fig. 6; *Id.*, Hedley, Rec. Austr. Mus., viii., 1912, p. 139; *Id.*, Smith, "Terra Nova" Exped., ii., Moll., 1915, p. 69.

This species was originally and doubtfully assigned to *Amauropsis.* I have already suggested that the genus *Pellilitorina* might appropriately contain it.

Two half-grown empty shells were dredged, December 28th, 1913, in 288 fathoms, bottom ooze, off the Mertz Glacier Tongue, Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′.

Lamellariopsis aurora *sp. nov.*

(Plate VII., fig. 82.)

Animal very soft, apparently depressed-cordate, back covered with large irregularly spaced tubercles. Mantle margin wide, extending far beyond the foot or body. Foot comparatively small, broad in front and pointed behind. Tentacles rather long and far apart, eyes at the external bases. Verge long and sickle-shaped. Length, about 70mm.

This species is described from torn and distorted material, but it evidently differs from the type of the genus *Lamellariopsis turqueti* Vayssiere,* by the absence of the grained cords which in that species reticulate the surface.

Three specimens, January 31st, 1914, from 110 fathoms, hard ground, off the Shackleton Ice-shelf, in South Lat. 64° 32′ and East Long. 97° 20′.

If *Lamellaria ampla* Strebel † is figured the natural size then the new form much exceeds it.

Marseniopsis mollis *Smith.*

Lamellaria mollis Smith, "Southern Cross" Coll., 1902, p. 205, pl. xxiv., figs. 19, 21.

Marseniopsis mollis Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 200; *Id.*, Smith, "Terra Nova" Exped., ii., Moll., 1905, p. 66.

From Commonwealth Bay: three, September 4th, 1912, from 25 fathoms; another December 14th, 1913, from 45-50 fathoms; another, December 21st, 1913, from 55-60 fathoms; and another, December 22nd, 1913, from 350-400 fathoms. One, December 28th, 1913, from 288 fathoms, ooze, off the Mertz Glacier, in South Lat. 66° 55′ and East Long. 145° 21′. One, January 21st, 1914, from 60 fathoms, rocky ground, off Drygalski Island. Two, January 27th, 1914, from 120 fathoms, rocky ground, in the Davis Sea, in South Lat. 66° 8′ and East Long. 94° 17′. One, January 31st, 1914, from 110 fathoms, hard ground, off the Shackleton Ice-shelf, in South Lat. 64° 32′ and East Long. 97° 20′.

Harpovoluta vanhoffeni *Thiele.*

Harpovoluta vanhoffeni Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 213, pl. xiv., fig. 1.

One of the Mawson collection is 75mm. long, so the species attains now a larger size as well as a wider range. Where the animal is present, a large commensal actinian is usually seated on the back of the shell.

* Vayssiére.—1st Expéd. Antarct. Franç., 1906, p. 40, pl. iv., figs. 42-3.

† Strebel.—Zool. Jahrb., xxiv., 1907, p. 145, pl. xi., figs. 70-1.

One, December 28th, 1913, from 288 fathoms, ooze, off the Mertz Glacier Tongue, Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′. Another, January 2nd, 1914, from 230 fathoms, ooze, off Wilkes Land, in South Lat. 65° 48′ and East Long. 137° 32′. Two, with an anemone to each, January 28th, 1914, from 240 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 20′ and East Long. 95° 27′ ; and another, January 31st, 1914, from 110 fathoms, stony bottom, off the Shackleton Ice-shelf, in South Lat. 64° 32′ and East Long. 97° 20′.

Marginella hyalina *Thiele.*

(Plate VII., fig. 83.)

Marginella hyalina Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 213, pl. xiii., fig. 26.

A single specimen dredged, December 31st, 1913, in 157 fathoms, D'Urville Sea, in South Lat. 66° 32′ and East Long. 141° 39′. It is 7·5mm. long, nearly twice the size of the type, it has also an additional whorl. It is, therefore, longer in proportion to breadth, the suture is margined, and the aperture ascends at the insertion of the lip.

Admete delicatula *Smith.*

Admete delicatula Smith, Nat. Antarct. Exped., ii., 1907, Moll., p. 4, pl. i., figs. 5, 5a ; *Id.*, " Terra Nova " Exped., ii., Moll., 1915, p. 74.

A single specimen, December 31st, 1913, from 157 fathoms, ooze, in the D'Urville Sea, in South Lat. 66° 32′ and East Long. 141° 39′.

Oenopota davisi *sp. nov.*

(Plate VIII., fig. 84.)

Shell ovate, rather thin, spire gradate. Colour buff. Whorls four, of which one and a half are nuclear. Sinus deep, subsutural, the fasciole forming a broad flat shelf. Sculpture : low, narrow, close-set, radial lamellæ, concave on the fasciole and forwardly directed on the body whorl, reticulated by fine close spiral incised lines which extend from the angle of the shoulder to the end of the snout. Aperture narrow oblong, outer lip thin and simple, canal short and broad, inner lip smoothed with a layer of callus. Length, 7 ; breadth, 4mm.

This appears to be related to *Bela plicatula* Thiele,* but is broader and is more densely spirally striate. It is named in honour of Capt. J. K. Davis, and in remembrance of the excellent oceanographic work which he achieved on the "Aurora."

Iredale has shown † that in its original sense *Bela* was synonymous with *Mangilia.* For the group generally but wrongly called *Bela* he recommended Morch's name of *Oenopota.*

* Thiele.—Deutsch. Südpol. Exped. xiii., 1912, p. 215, pl. xiv., fig. 4. † Iredale.—Proc. Malac. Soc., xi., 1915, p. 299.

A single specimen, December 28th, 1913, from 288 fathoms, ooze, off the Mertz Glacier Tongue, Adelie Land, in South Lat. 66° 52′ and East Long. 145° 30′.

Pontiothauma ergata *sp. nov.*

(Plate VIII., figs. 85, 86, 87.)

Shell large, thin and narrowly fusiform. Colour, uniform buff. Whorls of unknown number, contracted at the suture and flattened on the shoulder. Protoconch rather large, of two whorls, the first oblique, turbinate, the second vertical and radially striate. Sculpture: close spiral cords which increase from eight on the third whorl to 33 on the sixth. These are overrun in the line of growth by fine dense hair lines which describe a broad and rather deep sinus. Canal apparently short and open. Size unknown, the fragments suggest a length of from 80 to 100mm.

This novelty is represented by two broken specimens. The first complete from the apex to the fifth whorl in a length of 30mm., and thence broken; it was taken, January 28th, 1914, from 240 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 20′ and East Long. 95° 27′, and may serve as the type. The other is a fragment from the middle of a shell, consisting of a whorl and a half, and perhaps representing a ninth or tenth whorl; it was dredged December 28th, 1913, from 288-300 fathoms, ooze, off the Mertz Glacier Tongue, Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′.

Sipho gaini Lamy,* taken in 230 fathoms, off the South Shetlands, is very like this, and, perhaps, is identical. It seems, however, to differ by being broader in proportion to the length, by having a sharper apex, and especially by having the columella margin recurved.

Fusitriton aurora *sp. nov.*

(Plate VIII., figs. 88, 89, 90.)

Shell thin, subtranslucent, ovate-lanceolate, with mucronate apex, rounded whorls, evanescent varices, and no radial sculpture. Colour: shell white under a thin buff epidermis save for an ochreous yellow band on the columella callus and within the lip. Whorls tumid, rather rapidly increasing, wound obliquely, four and a turret protoconch; the latter of four smooth whorls, the third and fourth of which are almost the same diameter. Suture running in a groove. Sculpture: on the last whorl about 45, on the penultimate about 16 narrow, evenly spaced, raised, spiral cords, frequently with finer interstitial threads. Radial sculpture confined to faint growth lines, varices evanescent, represented by a notch at the suture and a double impressed line. Aperture pyriform, oblique, slightly sinuate at the shoulder of the whorl, outer lip thin, scarcely everted; inner lip marked by a substantial band of callus. Canal short, broad, open and slightly twisted. Operculum (fig. 90) with apical nucleus. Length, 83; breadth, 35mm.

* Lamy.—2nd Exped. Antarct. Franc., Moll., 1911, p. 7, pl. i., figs. 7-8.

A single specimen was dredged alive, February 24th, 1914, from 1,800 fathoms, ooze bottom, off the coast of South Australia, in South Lat. 35° 55½′ and East Long. 134° 18′.

Prosipho aurora *sp. nov.*

(Plate VIII., fig. 91.)

Shell conical, somewhat turreted. Whorls six, the first two forming a smooth turbinate protoconch, the others rounded with a sloping shoulder. Epidermis thin, persistent, buff, underlying shell white. Sculpture : on the body whorls are nine spirals, of which the median four are prominent, penultimate with five spirals, three being median and prominent and one following the suture of the lower whorl. Aperture pyriform, outer lip simple, canal short, inner lip excavate. Length, 7 ; breadth, 4mm.

Five years ago I prepared a figure and description, which still remains in editorial hands awaiting publication, of a shell from the so-called raised beach at Cape Royds. This species, with which I associated the name of the discoverer, Mr. E. R. Priestly, is related to the present form. *P. aurora* is, however, larger, comparatively broader, and has a shorter snout.

Eleven specimens were taken, July 4th, 1912, from 25 fathoms, Commonwealth Bay, Adelie Land.

Prosipho hunteri *sp. nov.*

(Plate VIII., fig. 92.)

Shell conical. Whorls five, of which the first two are smooth elongate-turbinate protoconch. Epidermis thin, buff colour. Sculpture : on the last whorl four spirals, of which the posterior is undulating and most developed, while the anterior ones are progressively fainter. On the upper whorls are two spirals, the posterior being most prominent and nodulous. The interstices between the cinguli are finely radiately striate. Aperture pyriform, outer lip simple, columella excavate, canal short and open. Length, 6 ; breadth, 3mm.

Named in honour of Mr. J. G. Hunter, Biologist at the Main Base.

Four specimens taken, July 4th, 1912, from 25 fathoms ; and five, December 14th, 1913, from 45-50 fathoms, Commonwealth Bay, Adelie Land.

Prosipho madigani *sp. nov.*

(Plate VIII., fig. 93.)

Shell conic-fusiform, somewhat turreted, flattened from the suture to the shoulder, rounded at the periphery and hollow at the base. Colour buff. Whorls six, the two first forming a smooth mucronate protoconch. Sculpture : on the last whorl are 12

spirals, of which five central ones are prominent and widely spaced; on the snout are three low and faint ones. The penultimate has five such spirals, one bordering the suture. Aperture pyriform, outer lip thin and simple, canal short, open, columella excavate at the inner lip. Length, 13·5; breadth, 4·3mm.

This species is named in honour of Mr. C. T. Madigan, who led an important exploring expedition from the Western Base.

Four specimens taken, July 4th, 1912, from 25 fathoms; and six, December 14th, 1913, from 45-50 fathoms, Commonwealth Bay, Adelie Land.

Prosipho mundus *Smith.*

var. *macleani* var. nov.

(Plate VIII., fig. 94.)

Prosipho mundus Smith, "Terra Nova" Exped., Zool., ii., Moll., 1915, p. 70, pl. i., fig. 10.

Before Mr. Smith's account of the "Terra Nova" mollusca reached me, I had prepared the following description as of a new species. My shell answers generally to *P. mundus*, but has the radial sculpture much fainter. It seems, therefore, proper to present the account prepared for a variety.

Shell ovate-lanceolate. Colour uniform pale buff. Whorls six, of which the upper two are smooth, rather elongate protoconch. Sculpture: the last whorl carries 13 spirals, a small one on the shoulder is followed by six median which are large and spaced, the rest diminish progressively towards the snout. The penultimate whorl has four prominent median, and one small subsutural keel. On the upper whorls are incipient radial ribs, and in the interstices of the cinguli of the lower whorls are fine radial striæ. Length, 8·5; breadth, 4mm.

Named in honour of Dr. A. L. Maclean, Medical Officer of the Expedition.

Four specimens taken, July 4th, 1912, from 25 fathoms, Commonwealth Bay, Adelie Land.

Prosipho spiralis *Thiele.*

Prosipho spiralis Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 209, pl. xiii., fig. 2.

One specimen, December 22nd, 1913, from 350-400 fathoms, in Commonwealth Bay, Adelie Land.

Pareuthria innocens *Smith.*

Thesbia innocens Smith, Nat. Antarct. Exped., ii., 1907, Moll., p. 4, pl. i., figs. 1, 1b; *Id.*, Hedley, Brit. Antarct. Exped., ii., 1911, p. 6.

Pareuthria innocens Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 212, pl. xiii., fig. 23, pl. xvi., fig. 22; *Id.*, Smith, "Terra Nova" Exped., Zool., ii., Moll., 1915, p. 72.

Several specimens, September 4th, 1912, from 25 fathoms; five, December 14th, 1913, from 45-50 fathoms; and one, November 21st, 1913, from 55-60 fathoms, in Commonwealth Bay, Adelie Land.

Probuccinum tenuistriatum *sp. nov.*

(Plate VIII., figs. 95, 96.)

Shell conical, thin, and semitransparent. Colour uniform isabelline, except the outer lip, which is white. Whorls five, the two first constituting a smooth dome-shaped protoconch. Epidermis thin, caducous, its fragments show fine radial laminæ. Sculpture: very fine and dense waved spiral hair lines, decussated at irregular intervals by corresponding growth lines and an occasional varix. Aperture oblique, anteriorly truncated, pyriform. Inner lip a thin smear of transparent callus. Outer lip thin, expanded and reflected posteriorly, supported by a distant and parallel varix. Canal wide, scarcely produced. Length, 16; breadth, 9mm.

This species is like, and possibly identical with, *Probuccinum tenerum*, as figured by Thiele (*op cit.*, pl. xiii., fig. 21), but differs in form and sculpture from *Neobuccinum tenerum*, as originally figured by Smith.

A single complete and fresh shell was taken, December 31st, 1913, from 157 fathoms, ooze, in the D'Urville Sea, in South Lat. 66° 32′ and East Long. 141° 39′.

Probuccinum costatum *Thiele.*

Probuccinum costatum Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 211, pl. xiii., fig. 22.

One, December 28th, 1913, from 288 fathoms, ooze, off the Mertz Glacier Tongue, Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′; one, January 27th, 1914, from 120 fathoms, rocky ground, in the Davis Sea, in South Lat. 66° 8′ and East Long. 94° 17′; and one, January 31st, 1914, from 120 fathoms, near the Shackleton Ice-shelf, in South Lat. 64° 32′ and East Long. 97° 20′.

Neobuccinum eatoni *Smith.*

(Plate IX., fig. 97.)

Buccinopsis eatoni Smith, Ann. Mag. Nat. Hist. (4), xvi., 1875, p. 68.

Neobuccinum eatoni Smith, Phil. Trans. Roy. Soc., clxviii., 1879 (1877), p. 169, pl. ix., figs. 1, 1a ; *Id.*, Studer, Archiv. Naturg., xlv., 1879, p. 129 ; *Id.*, Watson, Chall. Rep. Zool., xv., 1886, p. 216 ; *Id.*, Smith, Coll. "Southern Cross," Moll., 1902, p. 202 ; *Id.*, Thiele, Deutsch. Tiefsee Exped., vii., 1903, p. 168, pl. ix., fig. 57 ; *Id.*, Lamy, 1st Expéd. Antarct. Franç., 1906, Moll., p. 2 ; *Id.*, Smith, Nat. Antarct. Exped., ii., 1907, Moll., p. 1 ; Melvill and Standen, Trans. Roy. Soc. Edinb., xlvi., 1907, p. 139 ; *Id.*, Scotia Zool., v., 1907, p. 109 ; *Id.*, Wilton, Zool. Log. Scotia, 1908, p. 28, pl. xxiv., fig. 74 ; *Id.*, Lamy, Bull. Mus. Hist. Nat., xvi., 1910, p. 199 ; *Id.*, Lamy, 2nd Expéd. Antarct. Franç., 1911, Moll., p. 5 ; *Id.*, Lamy, Ann. Inst. Oceanograph., iii., fasc. 3, 1911, p. 41 ; *Id.*, Hedley, Brit. Antarct. Exped., ii., 1911, p. 6, pl. i., figs. 11,12 ; *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 211 ; *Id.*, Smith, "Terra Nova" Exped., ii., 1915, Moll., p. 72 ; *Id.*, Lamy, Bull. Mus. Hist. Nat., xxi., 1915, p. 69.

Neobuccinum præclarum Strebel, Schwed. Südpol. Exped., vi., 1908, p. 31, pl. iii., fig. 38.

Originally discovered at Kerguelen, this whelk is rarely missing from any Antarctic station, and seems to be abundant over a wide range in space and depth. Whether alive or dead the shell is almost invariably eroded. Only one of the Mawson collection preserved the natural surface. This, a half-grown and empty shell, from 60 fathoms, off Drygalski Island, has a thin straw-coloured epidermis, produced in fine spiral lines, about 30 to a whorl, of delicate, short, erect bristles. Radially, fine wrinkles connect the spirals (pl. ix., fig. 97). These bristle rows of the epidermis appear to have a specific and even generic importance.

From off Graham Land, Dr. H. Strebel has figured and described *Neobuccinum præclarum*, distinguished by the spiral lines of the epidermis from the reputedly smooth *N. eatoni*. It is now suggested that, as *N. eatoni* when perfect also possesses these spirals, *N. præclarum* must lapse.

Dr. Boog Watson, comparing *Chlanidota* * with the prior *Neobuccinum*, remarks that "the epidermis is curiously caducous," and considers that the bristle rows of *Chlanidota* alone distinguish that from *Neobuccinum*. Since *Neobuccinum* actually possesses this feature, Watson's conclusion that *Chlanidota* should be suppressed gains confirmation.

Several egg capsules, like those I have figured in the Shackleton report, were dredged with *N. eatoni*, on October 4th, 1912, in 25 fathoms, Commonwealth Bay. A dead and broken shell from 300 fathoms, off the Mertz Glacier Tongue, Adelie Land, is 70mm. in length, and if complete, would have reached at least 80mm. Besides these, the

* *Chlanidota* von Martens, Sitz. Ges. Naturf. Berlin, 1878, p. 23. The citation in the Zool. Record, 1877, Moll., p. 31, appears to establish priority for *Neobuccinum*, ostensibly published in 1879.

species was dredged from 15 fathoms (sea temperature 33° F.; bottom, brown algæ and stones) to 60 fathoms, alive, in Commonwealth Bay; and off the Shackleton Ice-shelf, in 240 fathoms (one dead, January 28th, 1914); and in 358 fathoms (one alive, January 31st, 1914).

Trophon albolabratus *Smith.*

Trophon albolabratus Smith, Ann. Mag. Nat. Hist. (4), xvi., 1875, p. 68; *Id.*, Kobelt, Conch. Cab., iii. (2), 1878, p. 307; *Id.*, Smith, Phil. Trans. Roy. Soc., clxviii., 1879, p. 170, pl. ix., fig. 2; *Id.*, Studer, Archiv. Naturgesch, xlv., 1879, p. 128; *Id.*, Sowerby, Thes. Conch., iv., 1880, p. 60, pl. ccccv., fig. 29; *Id.*, Watson, Chall. Rep. Zool., xv., 1886, p. 165; *Id.*, Melvill and Standen, Journ. of Conch., ix., 1898, p. 99; *Id.*, Martens, Deutsch. Tiefsee Exped., vii., 1903, p. 62; *Id.*, Strebel, Schwed. Südpol. Exped., vi., 1908, p. 42; *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 248.

Trophon cinguliferus Martens and Pfeffer, Jahrb. Hamburg. Wiss. Anst., iii., 1886, p. 70, pl. i., fig. 2; *Id.*, Melvill and Standen, Trans. Roy. Soc. Edinb., xlvi., 1907, p. 136.

Ten specimens were gathered at the storm drift line at Wireless Cove, Macquarie Island, by Mr. H. Hamilton. Some brachipods were thrown up at the same time, and both probably had lived together in the kelp zone. All these storm-tossed shells were chipped, worn, and decapitated; they reach a length of 40mm. and a breadth of 22mm. Compared with *Trophon ambiguus* of New Zealand, it has rounder whorls, a lower spire, and a finer network of longitudinal and transverse threads, the latter predominating.

Trophon condensatus *sp. nov.*

(Plate IX., fig. 98.)

Shell small, ovate-lanceolate, rather solid, glossy, gradate. Colour white. Exclusive of a smooth, two whorled, elongate, turbinate protoconch; there are four whorls, horizontal above a rather sharp shoulder angle and perpendicular below it, excavate at the base. Sculpture: dense, narrow, forwardly directed, curved varices, set at the rate of 30 to a whorl, and continued vertically from the suture to the snout. Aperture pyriform, outer lip simple, inner lip excavate. Canal short, open, recurved. Breadth, 4·5; length, 10mm.

T. condensatus is nearest related to *Trophon minutus* Melvill and Standen,* a shallow water form from South Orkneys and South Georgia. But in the same number of whorls, that is, about three-quarters of the length of *T. condensatus*, and having a third fewer varices, is less closely ribbed.

Six specimens were taken, October 4th, 1912, in 25 fathoms, Commonwealth Bay, Adelie Land. (Narrative p. 200.)

* Melvill and Standen.—Trans. Roy. Soc. Edinb., xlvi., 1907, p. 137, fig. 7; *Id.*, xlviii., 1912, p. 354; *Id.*, Strebel, Schwed. Südpol. Exped., vi., 1909, p. 44, pl. iv., figs. 47A-B.

Trophon coulmanensis *Smith.*

(Plate IX., fig. 99.)

Trophon coulmanensis Smith, Nat. Antarct. Exped., ii., 1907, Moll., p. 3, pl. i., fig. 4; *Id.*, " Terra Nova " Exped., Zool., ii., 1915, Moll., p. 73, pl. i., fig. 14.

A single specimen taken alive shows the fronds curling in above the whorls more perfectly than the shell originally figured. This illustration was prepared before Mr. Smith's subsequent figure had reached me. It is 18mm. long, and occurred, December 28th, 1913, in 288 fathoms, ooze, off the Mertz Glacier Tongue, Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′.

Trophon longstaffi *Smith.*

Trophon longstaffi Smith, Nat. Antarct. Exped., ii., 1907, Moll., p. 3, pl. i., fig. 3; *Id.*, Hedley, Brit. Antarct. Exped., ii., 1911, p. 8, pl. i., fig. 14; *Id.*, Smith, " Terra Nova " Exped., Zool., ii., Moll., 1915, p. 73.

From Commonwealth Bay: one, September 3rd, 1912, 12 fathoms; two, September 3rd, 1912, 25 fathoms; two, December 14th, 1913, 45-50 fathoms; two, December 21st, 1913, from 55-60 fathoms; and one, December 22nd, 1913, from 350-400 fathoms. Two, December 28th, 1913, from 288 fathoms, off the Mertz Glacier Tongue, Adelie Land, in South Lat. 66° 52′ and East Long. 145° 30′.

Trophon shackletoni *Hedley.*

Trophon shackletoni Hedley, Brit. Antarct. Exped., ii., 1911, Moll., p. 7, pl. i., fig. 13; *Id.*, Smith, " Terra Nova " Exped., Zool., ii., 1915, Moll., p. 73.

A specimen from off Drygalski Island might, if not broken, have attained a length of over 60mm. In general appearance it corresponds to those from McMurdos Sound but has fewer and wider spaced varices, and the spiral sculpture is more pronounced, being furrows rather than scratches.

A fragment, December 21st, 1913, from 55-60 fathoms, Commonwealth Bay; and two, January 21st, 1914, from 60 fathoms, off Drygalski Island, in South Lat. 65° 42′ and East Long. 92° 10′.

Kerguelenia redimiculum *Reeve.*

Siphonaria redimiculum Reeve, Conch. Icon., ix., 1856, pl. v., fig. 24; *Id.*, Smith, Phil. Trans. Roy. Soc., clxviii., 1879, p. 182; *Id.*, Martens, Deutsch. Tiefsee Exped., vii., 1903, p. 72.

Kerguelenia redimiculum Mabille and Rochebrune, Miss. Scient. Cap Horn, Moll., 1889, p. 28.

Mr. H. Hamilton collected 18 specimens on " rocks in littoral zone " at Macquarie Island, of a form thus determined, which is, however, smoother than Reeve's figure,

and has the apex within the margin. For a species from the subantarctic islands of New Zealand, Mr. T. Iredale has proposed the name *Kerguelenia innominata.** I have not the means to institute a comparison between that and the Macquarie Island shell. Specimens of *Kerguelenia* brought from Macquarie Island by Mr. A. Hamilton in 1894, differ from the present series by being larger, with the apex further inwards from the margin, more radially furrowed, and of a paler colour. Perhaps they represent *K. lateralis* Gould.

Phrixgnathus hamiltoni *Suter.*

Laoma campbellica Hamilton, Trans. N.Z. Inst., xxvii., (1894) 1895, p. 577 (misidentification).

Laoma hamiltoni Suter, Proc. Malac. Soc., ii., 1896, p. 37, pl. iv., fig. 22-24 ; *Id.*, Suter, Man. N.Z. Moll., 1913, p. 753, pl. x., fig. 11.

Though it is so minute this snail is important because it is the most southern of the world.

Mr. A. Hamilton, the discoverer of this small species, found it to be plentiful in decaying vegetation at Lusitania Bay. His son, Mr. H. Hamilton, found 30 specimens, December 15th, 1911, on stems of the "Maori Cabbage," † near Charlotte Cove, and in August, 1912, he collected 17 specimens in rock crevices, under tussocks, and in *Stilbocarpa polaris*, at Garden Bay, north-east end of Macquarie Island.

Agriolimax agrestis *Linne.*

Agriolimax agrestis Taylor, Monog. Brit. Land and f. w. Mollusca, 1903, p. 104.

This small European slug has been introduced, occurring about the roots of *Stilbocarpa polaris* and under wood and stones, near the huts at Lusitania Bay, Macquarie Island.

Turbonilla lamyi *sp. nov.*

(Plate IX., fig. 100.)

Shell small, rather solid, subcylindrical. Colour buff. Remaining whorls six, rather flattened medially and constricted at the suture. Base rounded, unsculptured. On the last whorl there are 17 strong, perpendicular ribs, ceasing abruptly at the periphery and failing to undulate the suture. These are parted by deeply excavate intercostal spaces of the same breadth. There is no spiral sculpture. Aperture rhomboidal, columella perpendicular, thickened, with a slight median twist. Length 3·6 ; breadth, 1·1mm.

* Iredale.—Trans. N. Zeal. Inst., xlvii., 1915, p. 478. † "Home of the Blizzard," ii., 1915, p. 181, 232.

This novelty is named in honour of Dr. Edouard Lamy, of the Paris Museum, whose valuable contributions to Antarctic conchology are so frequently referred to in this report. It belongs to the subgenus *Chemnitzia*, as defined by Dall and Bartsch.* The species seems nearest to, and possibly identical with, *T. smithi* Strebel,† not Verrill, from Lemaire Straits. Judging from that figure, our shell, though of equal size, seems to have shorter whorls, and to be of more cylindrical habit. The species is represented by a single very worn and decapitated individual which Mr. H. Hamilton "found, January 2nd, 1913, in scrapings from rocks below low water, at Lusitania Bay, Macquarie Island."

Neactæonina fragilis *Thiele.*

Neactæonina fragilis Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 219.

With doubt a single broken specimen 6·5mm. long is thus named. It came, December 28th, 1913, from 288 fathoms, ooze, off the Mertz Glacier Tongue, Adelie Land, in South Lat. 66° 52′ and East Long. 145° 30′.

Toledonia globosa *sp. nov.*

(Plate IX., fig. 101.)

Shell globose-ovate, thin. Colour white. Whorls four, rounded, subgradate above. Surface smooth and glossy, marked by faint growth lines. Aperture reniform, outer lip simple, thin, semicircular. Columella knee-shaped, projecting abruptly into the aperture, its margin reflected over a minute axial perforation. A thin callus on the inner lip extending from insertion to insertion. Length, 6 ; breadth, 4mm.

Six, December 28th, 1913, from 288 fathoms, off the Mertz Glacier Tongue, Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′.

Toledonia major *Hedley.*

var. elata *var. nov.*

Odostomiopsis major Hedley, Brit. Antarct. Exped., ii., 1911, p. 6, pl. i., figs. 9, 10.

Toledonia major Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 218, pl. xiv., figs. 14, 15.

The present form is rather longer and narrower than the type from off Cape Royds, with a specimen of which I have compared it. This is the variety which has been figured by Thiele.

Twenty, October 4th, 1912, from 25 fathoms ; one, December 14th, 1913, from 45-50 fathoms ; and one, December 21st, 1913, from 55-60 fathoms, Commonwealth Bay. Four, December 28th, 1913, from 288 fathoms, ooze, off the Mertz Glacier Tongue, Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′.

* Dall and Bartsch.—Bull. 68, U.S. Nat. Mus., 1909, p. 33.

† Strebel.—Zool. Jahrb., xxii., 1905, p. 659, pl. xxiii., fig. 42 ; xxiv., 1907, p. 169.

Newnesia antarctica *Smith.*

Newnesia antarctica Smith, Coll. "Southern Cross," 1902, p. 208, pl. xxv., figs. 1-6; *Id.*, Eliot, Journ. of Conch., xi., 1906, pp. 312-5, fig. 6; *Id.*, Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 218.

With this should be compared Strebel's genus *Anderssonia.*

One, December 28th, 1913, from 230 fathoms, ooze, off the Mertz Glacier Tongue, Adelie Land, in South Lat. 65° 48′ and East Long. 137° 32′. Two with the animal complete, January 31st, 1914, from 110 fathoms, stony bottom, off the Shackleton Ice-shelf, in South Lat. 64° 32′ and East Long. 97° 20′.

Clione antarctica *Smith.*

Clione antartica Smith, Coll. "Southern Cross," 1902, p. 210, pl. xxv., figs. 7, 8.

During calm weather in April Sir Douglas Mawson observes that pteropods were noticed swimming near the beach.*

Four specimens, September 14th, 1912, and October 7th, 1912, from Commonwealth Bay, are noted as being pink on the anterior half of the body and colourless posteriorly. Dr. A. L. MacLean obtained four more from the surface of the boat harbour in Commonwealth Bay in 1913.

This species has been omitted by Dr. Tesch from his monograph of the Pteropoda in "Das Tierriech."

Cliodita caduceus *Quoy and Gaim.*

Cliodita caduceus Quoy and Gaim, Ann. Sci. Nat. (I.), vi., 1825, p. 74, pl. ii., fig. 4; *Id.*, Voy. Uranie et Phys. Zool., 1825, p. 413, pl. lxvi., fig. 1.

Spongiobranchæa australis Orbigny, Voy. Amer. Merid., 1840, p. 131, pl. xix., figs. 1-7; *Id.*, Pelseneer, Chall. Rep. Zool., xix., 1887, p. 19, pl. i., figs. 6-7; *Id.*, Meisenheimer, Voy. Valdivia, ix., 1905, p. 47, pl. xvi., fig. 4; *Id.*, Tesch, Das Tierreich, Pteropoda, 1913, p. 110, fig. 80.

Mr. Hamilton gathered a score of specimens, averaging 20mm. in length, at the north end of Macquarie Island, stranded on the beach, April 17th, 1912, after a gale. These more resemble the figure of Meisenheimer than that of Pelseneer.

Dr. A. L. Maclean collected three small ones on the surface of Commonwealth Bay in 1913. Six more were netted by Hunter and Hamilton, January 14th, 1914, among the pack ice off Knox Land.

* Mawson.—"Home of the Blizzard," i., 1915, p. 132.

Doris antarctica *sp. nov.*

(Plate IX., fig. 102.)

Animal large, thick, oblong. Dorsal surface evenly and closely covered with fine grains among which larger grains are set at about 3mm. or 4mm. apart. Branchiæ 12, bipinnate, exsert in the preserved specimen. Rhinophores perfoliate, retractile in simple pockets about 20mm. apart. Length, as contracted, 100; breadth, 60; height, 50mm.

Jaw absent. Radula (text fig. 3) of 39 half rows; the laterals with simple, long, oblique, knife-like cusps which diminish medially till on the subrachidian there is a small and shortly reflected cusp.

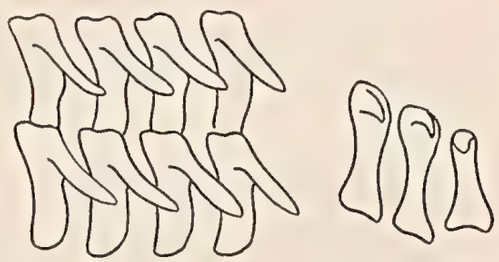


Fig. 3.

Two specimens from 350-400 fathoms, Commonwealth Bay.

The salient characters of this species are its large size and finely tuberculate dorsal surface. Sir C. Eliot remarks that Bergh's classification improperly extinguishes the Linnean *Doris*.* He therefore remodels *Doris* to include *Staurodoris* (= *Dorissensu stricto*), *Archidoris*, *Ctenodoris*, *Anisodoris*, and *Homoiodoris*. The present species is referable to the first section which already includes five Antarctic members.

Doris nivalis *Thiele.*

Archidoris tuberculata, var., Vayssiere, First Expéd. Antarct. Franç., 1906, Nudibranch., p. 4, pl. iii., figs. 39-41.

Archidoris nivalis Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 221.

The tubercles on the back are of equal size in the largest, as in the smallest specimen, so that the older are comparatively smoother in appearance.

From Commonwealth Bay—one, September 3rd, 1912, from 25 fathoms; and another, December 21st, 1913, from 55-60 fathoms. One, January 31st, 1914, from 110 fathoms, hard ground, off the Shackleton Ice-shelf, in South Lat. 64° 32′ and East Long. 97° 20′; the latter is 65mm. long. One, January 27th, 1914, from 120 fathoms, hard ground, in the Davis Sea, in South Lat. 66° 8′ and East Long. 95° 17′; this has a length of 70mm.

* Eliot.—Brit. Nudibranch, Mollusca, 1910, p. 95; and Apstein-Sitz, Gesell. Naturf. Fr. Berlin, 1915, p. 121.

Bathydoris hodgsoni *Eliot.*

Bathydoris hodgsoni Eliot, Nat. Antarct. Exped., 1907, Nudibranch., p. 12, figs. E., G., 12-16; *Id.*, Evans, Trans. Roy. Soc. Edinb., l., 1914, p. 192.

One, January 27th, 1914, from 120 fathoms, hard ground, in the Davis Sea, in South Lat. 66° 8′ and East Long. 94° 17′. Another, January 29th, 1914, from 325 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 6′ and East Long. 96° 13′.

Aegires albus *Thiele.*

Aegires albus Thiele, Deutsch. Südpol. Exped., xiii., 1912, p. 222, text fig. 7, pl. xix., fig. 4.

One specimen, 15mm. long, January 27th, 1914, from 120 fathoms, hard ground, in the Davis Sea, in South Lat. 66° 8′ and East Long. 94° 17′.

Tritoniella sinuata *Eliot.*

Tritoniella sinuata Eliot, Nat. Antarct. Exped., 1907, Nudibranch., p. 10, figs. C. 9-11.

From Commonwealth Bay—one, September 4th, 1912, from 25 fathoms; and another, December 22nd, 1913, from 350-400 fathoms.

Notæolidia depressa *Eliot.*

Notæolidia depressa Eliot, Nat. Antarct. Exped., 1907, Nudibranch., p. 20, figs. H., I., 22-24.

One, September 4th, 1912, from 25 fathoms, in Commonwealth Bay. One, December 28th, 1913, from 288 fathoms, ooze, off the Mertz Glacier, Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′. One, January 31st, 1914, from 110 fathoms, hard ground, off the Shackleton Ice-shelf, in South Lat. 64° 32′ and East Long. 97° 20′.

GASTEROPOD EGGS.

(Plate IX., fig. 103.)

What appears to be the ova of some gasteropod is a ribbon wound by its edge about a stalk of Alcyonarian fibre. There are about eight whorls about 1mm. thick, each coil about 12mm. in diameter. The flat side is plicate, radially from the axis, by bundles of ova.

This was dredged, December 28th, 1913, in 288 fathoms, ooze, off the Mertz Glacier, Adelie Land, in South Lat. 66° 55′ and East Long. 145° 21′.

Class SCAPHOPODA.

Dentalium majorinum *Mabille and de Rochefort.*

(Plate IX., figs. 104, 105.)

Dentalium majorinum Mabille and de Rochefort, Miss. Scient. Cap Horn, vi., Moll., 1889, p. 100, pl. iv., fig. 10 ; *Id.*, Pilsbry and Sharp, Man. Conch., xvii., 1898, p. 27, pl. xii., figs. 98, 99 ; *Id.*, Plate, Deutsch. Südpol. Exped., x., 1908, p. 5 ; *Id.*, Smith, " Terra Nova " Exped., Zool., 1915, Moll., p. 74.

A *Dentalium* of frequent occurrence in the area examined is thus determined, and for more exactitude a figure is supplied of a specimen 36mm. long and 3·5mm. broad, from near the Shackleton Ice-shelf. Most are severely eroded ; on better preserved material from 15 to 24 ribs appear ; these increase by intercalation. An injured specimen is 47mm. long.

There were dredged, December 28th, 1913, nine from 288 fathoms, ooze, off the Mertz Glacier Tongue, in South Lat. 66° 55′ and East Long. 145° 30′. One, January 2nd, 1914, from 230 fathoms, ooze, off the coast of Wilkes Land, in South Lat. 65° 48′ and East Long. 137° 32′. One, January 28th, 1914, from 240 fathoms, ooze, off the Shackleton Ice-shelf, in South Lat. 65° 20′ and East Long. 95° 27′. In the same neighbourhood, two, January 29th, 1914, from 325 fathoms ; one January 31st, 1914, from 110 fathoms ; and four, January 31st, 1914, from 358 fathoms.

EXPLANATION OF PLATES.

Fig.

Plate I.

1, 2.—Interior and exterior of valve of *Pronucula mesembrina* Hedley. Type specimen.

3, 4.—Dorsal and lateral view of *Malletia sabrina* Hedley. Type specimen.

5, 6, 7.—Exterior, bare and dressed in epidermis, and hinge of *Philippiella bagei* Hedley. Type specimen.

8, 9, 10, 11.—Exterior, bare and dressed in epidermis, hinge and prodissoconch of *Philippiella hamiltoni* Hedley. Type specimen.

12, 13.—Exterior, draped in epidermis, and hinge of *Philippiella orbiculata* Hedley. Type specimen.

Plate II.

14, 15.—Broken valve of adult type of *Chlamys subantarctica* Hedley, and a young shell, 6mm. high, assigned to this species.

16.—Exterior of *Lima closei* Hedley. Type specimen.

17, 18, 19.—Exterior and hinges of *Gaimardia smithi* Suter.

20, 21, 22.—Exterior and hinges of *Gaimardia trapezina* Lamk., var. *coccinea* Hedley.

23, 24.—Exterior and hinge of *Kidderia macquariensis* Hedley. Type specimen.

25, 26, 27.—Exterior and hinges of *Kidderia pusilla* Gould.

Plate III.

28.—Exterior of *Pholadomya antarctica* Hedley. Type specimen.

29, 30.—Dorsal and lateral views of *Pholadomya mawsoni* Hedley. Type specimen.

31, 32.—Dorsal and lateral views of *Pholadomya adelaidis* Hedley. Type specimen.

33, 34.—Dorsal and lateral aspects of *Venericardia astartoides* von Martens.

35, 36, 37.—Anterior and lateral aspects and hinge of *Ptychocardia rudis* Hedley. Type specimen.

38, 39.—Exterior and hinge of *Pseudokellia stillwelli* Hedley. Type specimen.

Plate IV.

40, 41.—Exterior and hinge of *Rochefortia macquariensis* Hedley. Type specimen.

42, 43, 44.—Exterior and hinge of *Lasœa consanguinea* Smith.

45, 46.—Hinge of *Lasœa australis* Lamarck, from Gerrigong, New South Wales, for comparison with *L. consanguinea*.

47, 48, 49, 50.—Dorsal, lateral, and interior aspects of type specimen of *Chione mawsoni* Hedley. Lateral aspect of radially striated variety.

51, 52, 53.—Exterior and hinges of *Saxicava antarctica* Philippi.

Plate V.

54, 55.—Dorsal and oral aspects of *Schismope subantarctica* Hedley. Type specimen.

56, 57.—Basal and peripheral aspects of *Margarella macquariensis* Hedley. Type specimen.

58.—*Submargarita smithiana* Hedley. Type specimen.

59.—*Minolia thielei* Hedley. Type specimen.

60, 61.—Shell and animal (from alcoholic specimen) of *Photinula coruscans* Hedley. Type specimen.

Fig.

PLATE VI.

62, 63.—Apical and lateral aspects of *Radiacmea macquariensis* Hedley. Type specimen.
64.—*Lepeta depressa* Hedley. Type specimen.
65, 66, 67, 68.—*Nacella delesserti* Phillipi. Adult from above and from the side ; young specimen 12mm. long, from above, and animal from alcoholic specimen.
69.—Animal of *Cellana variegata* Blainville, from Middle Harbour, Sydney, drawn from life for comparison with *Nacella*, showing cervical gap in branchial ruff and absence of pedal flounce.
70.—*Brookula* sp.
71, 72.—Young and adult of *Lævilitorina antarctica* Smith var.
73.—*Lævilitorina hamiltoni* Smith.

PLATE VII.

74.—*Eatoniopsis ainsworthi* Hedley. Type specimen.
75.—*Tatea melvilli* Hedley. Type specimen.
76.—*Subonoba bickertoni* Hedley. Type specimen.
77.—*Subonoba wilkesiana* Hedley. Type specimen.
78.—*Eumeta strebeli* Thiele.
79.—*Melanella laseroni* Hedley. Type specimen.
80.—*Stilifer polaris* Hedley. Type specimen.
81.—*Friginatica pisum* Hedley. Type specimen.
82.—*Lamellariopsis aurora* Hedley. Type specimen.
83.—*Marginella hyalina* Thiele.

PLATE VIII.

84.—*Oenopota davisi* Hedley. Type specimen.
85, 86, 87.—*Pontiothauma ergata* Hedley, imperfect upper portion of type, separate larger median whorl and detail sculpture of another specimen.
88, 89, 90.—*Fusitriton aurora* Hedley. Type specimen, complete shell, apex and operculum.
91.—*Prosipho aurora* Hedley. Type.
92.—*Prosipho hunteri* Hedley. Type.
93.—*Prosipho madigani* Hedley. Type.
94.—*Prosipho mundus* Smith, var. *macleani* Hedley.
95, 96.—*Probuccinum tenuistriatum* Hedley. Type specimen, from the front and side.

PLATE IX.

97.—Sculpture of *Neobuccinum eatoni* Smith.
98.—*Trophon condensatus* Hedley. Type specimen.
99.—*Trophon coulmanensis* Smith, to show development of fronds.
100.—*Turbonilla lamyi* Hedley, from imperfect type specimen.
101.—*Toledonia globosa* Hedley. Type.
102.—*Doris antarctica* Hedley. Type.
103.—Ova of large unknown Gasteropod.
104, 105.—*Dentalium majorinum* Mabille and Rochefort, whole and in basal section.

INDEX.

PAGE.

Acanthochiton 34
Acmæa 15, 16
Acolus 30
Adacnarca 8, 9, 10, 11, 12, 13, 14, 22
adarensis Ovirissoa 8
adarensis Rissoa 47, 48
adelaidis Pholadomya 10, 13, 28, 69
Admete 11, 54
Aegires 13, 66
agrestis Agriolimax 62
Agriolimax 62
ainsworthi Eatoniopsis 16, 46, 70
albolabratus Trophon 16, 60
albus Aegires 13, 66
Amauropsis 52
ambiguus Trophon 60
ampla Lamellaria 53
analoga Puncturella 16, 37
Anatina 27
Andersonia 64
anatinus Solen 27
Anisodoris 65
antarctica Doris 10, 65, 70
antarctica Cerithiopsilla 8, 49
antarctica Clione 7, 64
antarctica Lævilitorina 7, 8, 45, 70
antarctica Lovenella 49
antarctica Lepeta 41 42
antarctica Newnesia 11, 14, 64
antarctica Pholadomya 10, 28, 69
antarctica Paludestrina 45
antarctica Saxicava 16, 33, 69
antarctica Trichotropis 11, 50
antarctica Trochaclis 13, 51
antarctica Venus 33
antiaustralis Chlamys 23
arctica Saxicava 15
Arca 19
Archidoris 65
astartoides Cardita 30
astartoides Venericardia 13, 14, 30, 69
Athoracophorus 15, 16
aucklandicum Calliostoma 39
aucklandica Lissarca 15, 19

PAGE.
aucklandica Plaxiphora 36
aucklandica Thoristella 15, 39
aureus Chiton 35
aurea Plaxiphora 16, 35
aurora Fusitriton 55, 70
aurora Lamellariopsis 14, 53, 70
aurora Prosipho 8, 56, 70
australis Lasæa 33, 69
australis Spongiobranchæa 64
Axinopsis 13, 14, 27

bagei Philippiella 7, 8, 9, 20, 69
Bathydoris 13, 66
beddomei Friginatica (Natica) 51
Bela 54
bickertoni Subonoba 8, 9, 47, 70
bicolor Modiolarca 24, 26
bispinus Harpagifer 45
Brookula 16, 44, 45, 70
Buccinopsis 59

caliginosa Paludestrina 45
caduceus Cliodita 7, 64
caliginosa Hydrobia 45
caliginosa Lævilitorina 15, 16, 45
caliginosa Littorina 45
Calliostoma 39
Callochiton 9, 10, 11, 13, 35
campbelli Plaxifora 35
campbelli Radiacmea 41
campbellica Laoma 62
cannellieri Modiolarca 25
Cantharidus 15, 40
cantharus Acmæa 15
capillacea Photinula 15
capillaceus Trochus 40
Cardita 30
carmichaelis Chiton 35
castaneus Chiton 34
cazini Ovirissoa 47
Cellana 43, 70
cepacea Natica 51
Cepatia 51
Cerithiopsilla 8, 49
Cernina 51
Chætopleura 35, 36
charcoti Montaguia 32
charcoti Rochfortia 16, 32
charcoti Tellimya 32
Chemnitzia 63
Chione 16, 33, 69
Chiton 34, 35
Chlamys 5, 8, 12, 13, 14, 16, 22, 23, 69

PAGE.
Chlanidota 59
cinguliferus Trophon 60
clausa Natica 51
Cliodota 7, 64
Clione 7, 64
closei Lima 14, 23, 69
coccinea Gaimardia 16, 25, 69
Cochlis 51
colbecki Chlamys 5, 8, 12, 13, 14, 22, 23
colbecki Pecten 22, 35
columna Ovirissoa 47
commensalis Melanella 50
condensatus Trophon 8, 60, 70
consanguinea Lasæa 16, 32, 69
consanguinea Kellia 32
coppingeri Lepeta 8, 9, 41, 42
coppingeri Pilidium 41
cordiformis Pseudokellya 31
coruscans Photinula 16, 40, 41, 69
costatum Probuccinum 11, 13, 14, 58
coulmanensis Trophon 11, 61, 70
couthouyi Acanthochiton 34
crassa Modiolarca 25
crebrilulirata Submargarita 7, 8, 9, 38
crebrilulirata Valvatella 38
crenatulifera Philippiella 20
Cryptonatica 51
Ctenodoris 65
Cuspidaria 11, 29
Cyamiomactra 30
Cyamium 9, 11, 13, 15, 16, 26, 30
Cyclostrema 45
Cytherea 33

davisi Oenopota 11, 54, 70
debilis Axinopsis 13, 14, 27
decorosa Pronucula 17
decussatum Cyclostrema 45
delesserti Nacella 16, 42, 70
delesserti Patella 42
delicatula Admete 11, 54
delicatula Friginatica (Natica) 52
Dentalium 11, 12, 13, 14, 67, 70
depressa Lepeta 13, 42, 70
depressa Notæolidia 8, 9, 11, 14, 66
depsta Patella 43
deserta Subonoba 9, 48
deserta Rissoa 48
Diplodonta 30
Doris 8, 9, 10, 13, 14, 65, 70
dulcis Minolia 8, 9, 10, 11, 39
dulcis Margarites 39
dulcis Valvatella 39

PAGE.
eatoni Neobuccinum 5, 7, 8, 9, 11, 13, 14, 22, 59, 70
eatoni Buccinopsis 59
Eatonia 46
Eatoniella 8, 9, 46
Eatoniopsis 16, 46, 70
effosa Natica 51
elliptica Laternula 5, 8, 27
elliptica Anatina 27
elata Toledonia 8, 9, 11, 63
emarginuloides Patella 41
ergata Pontiothauma 11, 13, 55, 70
Eulima 49
Eumeta 9, 49, 70
Euspira 51
expansa Margarella 37
exulata Melanella 9, 10, 49
exulata Eulima 49

falklandica Puncturella 37
ferruginea Patella 44
fragilis Neactæonina 11, 63
fraudulenta Rissoa 48
frigida Chætopleura 36
Friginatica 8, 13, 16, 51, 52, 70
fuegiensis Modiolarca 25
fuegiensis Nacella 15
Fusitriton 55, 70

Gaimardiadæ 26
Gaimardia 16, 24, 25, 26, 33, 69
gaini Sipho 55
Gasteropod 11, 66, 70
gaussi Callochiton 9, 10, 11, 13, 35
Gasteropoda 11, 36, 51
gelida Subonoba 8, 9, 48
gelida Rissoa 48
georgiana Ovirissoa 47
glacialis Subonoba 8, 9, 48
glacialis Rissoa 48
globosa Toledonia 11, 63, 70
gourdoni Arca 19
gourdoni Lissarca 19
gradata Pseudokellya 31
grandis Limopsis 10, 14, 19
grisea Friginatica 8, 13, 52
grisea Natica 52

hahni Chætopleura 36
hahni Modiolarca 25
hamiltoni Lævilitorina 15, 16, 46, 70
hamiltoni Laoma 15, 62
hamiltoni Philippiella 16, 21, 69
hamiltoni Paludestrina 46

PAGE.
hamiltoni Phrixgnathus 16, 62
Harpovoluta 11, 12, 13, 14, 53
Harpagifer 45
hedleyi Pronucula 17
Hemiarthrum 16, 34
Heteromactra 30
Hochstetteria 20
hodgsoni Lima 10, 11, 12, 14, 24
Homoiodoris 65
hodgsoni Bathydoris 13, 66
hyalina Marginella 11, 54, 70
Hydrobia 45
hunteri Prosipho 8, 9, 56, 70

illuminata Nacella 15, 43
impactus Musculus 26
incerta Diplodonta 30
inflata Eatoniella 46
infelix Cuspidaria 11, 29
innocens Pareuthria 9, 58
innocens Thesbia 58
innominata Kerguelenia 62

Jukesena 30

Kellia 8, 9, 31, 32
kerguelenensis Eatoniella 8, 9, 46
kerguelenensis Eatonia 46
kerguelenensis Lepidopleurus 16, 34
kerguelenensis Leptochiton 34
kerguelenensis Nacella 16, 44
kerguelenensis Patella 44
Kerguelenia 16, 61, 62
kermadecensis Pronucula 17
Kidderia 16, 26, 29

labellata Natica 51
Lævilitorina 7, 8, 15, 16, 45, 46, 70
lævis Philippiella 20
Lamellariopsis 14, 53, 70
Lamellaria 53
lamyi Turbonilla 16, 62, 70
Laoma 15, 62
Lasæa 15, 16, 32, 33, 69
laseroni Melanella 8, 49, 70
lateralis Kerguelenia 62
lateralis Siphonaria 15
Laternula 5, 8, 27
Leda 14, 17, 18
Lepeta 8, 9, 13, 41, 42, 70
Lepidopleurus 16, 34
lephayi Modiolarca 25
Leptochiton 34

PAGE.
Leptomya 15, 29
Lima 8, 10, 11, 12, 14, 23, 24, 69
Limax 16
limoides Philippiella 20
Limopsis 10, 14, 19
lintea Tellina 29
lintea Leptomya 29
Lissarca 8, 9, 10, 11, 14, 15, 19
Littorina 45
longicaudata Poroleda 10, 13, 18
longicaudata Leda 18
longstaffi Trophon 7, 8, 9, 10, 11, 61
Lovenella 49

macleani Prosipho 8, 57, 70
macquariensis Kidderia 16, 26, 69
macquariensis Margarella 16, 37, 69
macquariensis Radiacmea 16, 41, 70
macquariensis Rochfortia 16, 32, 69
madigani Prosipho 8, 9, 56, 70
magellanica Patella 44
major Toledonia 8, 9, 11, 63
major Odostomiopsis 63
majorinum Dentalium 11, 12, 13, 14, 67, 70
Malletia 10, 13, 14, 18, 69
Mammilla 51
Mammillaria 51
mammilla Nerita 51
Mangilia 54
Margarella 7, 8, 9, 10, 13, 16, 37, 69
Margarites 38, 39
Marginella 11, 54, 70
Marseniopsis 8, 9, 10, 11, 12, 13, 14, 53
martensi Athoracophorus 15
mawsoni Chione 16, 33, 69
mawsoni Pholadomya 10, 13, 28, 69
Melanella 8, 9, 10, 49, 70
meleagrina Philobrya 15, 20, 21
melvilli Tatea 16, 46, 70
meridionalis Thracia 10, 12, 13, 29
mesembrina Pronucula 16, 17, 69
miliaris Lasæa 15, 32
minor Cantharidus 40
Minolia 8, 9, 10, 11, 39, 69
minor Photinula 15
minutus Trophon 60
mirabilis Trichoconcha 10, 11, 12, 50
mirabilis Torellia 50
mirandus Notochiton 11, 14, 35
miranda Chætopleura 35
Modiolarca 15, 24, 25, 26
Modiola 25
mollis Marseniopsis 8, 9, 10, 11, 12, 13, 14, 53

PAGE.
mollis Lamellaria 53
Montaguia 32
mouchezi Schismope 36
mundus Prosipho 8, 57, 70
Musculus impactus 26
Mya 27
Mysella 29
Mytilidæ 26
Mytilus 21, 26

Nacella 15, 16, 42, 43, 44, 70
Natica 51, 52
Neactæonina 11, 63
Neobuccinum 5, 7, 8, 9, 11, 13, 14, 22, 58, 59, 70
Nerita 51
Newnesia 11, 14, 64
nimrodiana Kellia 8, 9, 31
nitens Adacnarca 8, 9, 10, 11, 12, 13, 14, 22
nivalis Doris 8, 9, 13, 14
nivalis Archidoris 65
noachina Puncturella 37
Notæolidia 8, 9, 11, 14, 66
Notochiton 11, 14, 35
Notomytilus 20
notorcadensis Lissarca 8, 9, 10, 11, 14, 19

oblonga Leda 14, 17
oblongum Cyamium 15, 26
Odostomiopsis 63
Oenopota 11, 54, 70
orbiculata Philippiella 10, 12, 20, 21, 69
ovalis Lima 8, 24
ovalis Tellimya 32
ovata Subonoba 8, 48
ovata Rissoa 48
Ovirissoa 8, 47
Ova of large unknown Gasteropod 70

pagenstecheri Leptochiton 34
Paludestrina 45, 46
Pareuthria 9, 58
Patella 41, 42, 43, 44
Pecten 22, 35
Pelecypoda 11, 17
Pellilitorina 11, 52
perconfusa Leptomya 15, 29
perobtusus Cantharidus 15, 40
petterdi Stilifer 50
Phaseolicama 25
Philippiella 7, 8, 9, 10, 12, 16, 20, 69
Philobrya 7, 8, 9, 15, 19, 20, 21
Phrixgnathus 16, 62
Pholadomya 10, 13, 28, 69

PAGE.
Photinula 15, 16, 40, 41, 69
Pilidium 41
pisum Friginatica 16, 52, 70
Plaxiphora 15, 16, 35, 36
plicata Cuspidaria 11, 29
plicatula Bela 54
polaris Stilifer 13, 50, 70
polaris Stilbocarpa 62
Polinices 51
polita Natica 51
Pontiothauma 11, 13, 55, 70
Poroleda 10, 13, 18
præclarum Neobuccinum 59
Probuccinum 11, 13, 14, 58, 70
Pronucula 16, 17, 69
Prosipho 8, 9, 10, 56, 57, 70
prismatica Anatina 27
pruinus Cantharidus 15, 40
Pseudokellya 11, 13, 31, 69
Ptychocardia 9, 11, 30, 31, 69
Puncturella 16, 37
pusilla Gaimardia 33
pusilla Kidderia 16, 26, 69
pusilla Modiolarca 15, 26
pyriformis Natica 51
pusillus Mytilus 26

quadrata Philippiella 20

racovitzai Pecten 22
Radiacmea 16, 41, 70
redimiculum Kerguelenia 16, 61
redimiculum Siphonaria 61
redimiculum Patella 42
refulgens Margarella 7, 8, 9, 10, 13, 37
refulgens Valvatella 37
retiarium Calliostoma 39
Rissoa 47, 48, 49
Rochfortia 16, 32, 69
rotundatum Cyamium 9, 11, 13, 30
rossiana Pellilitorina 11, 52
rouchi Sicula 10, 18
rubra Notomytilus 20
rubra Philippiella 20
rudis Ptychocardia 11, 31, 69
rufa Natica 51

sabrina Malletia 10, 13, 14, 18, 69
savatieri Chætopleura 36
savatieri Modiolarca 25
Saxicava 15, 16, 33, 69
Scaphopoda 11, 67
Schismope 16, 36, 39

PAGE.
setiger Chiton 35
setigera Plaxiphora 35
setulosum Hemiarthrum 16, 34
shackletoni Trophon 9, 12, 61
Silicula 10, 18
sinuata Tritoniella 8, 10, 66
Sipho 55
Siphonaria 15, 61
smithi Gaimardia 16, 24, 69
smithi Modiolarca 15, 25
smithi Turbonilla 63
smithiana Submargarita 13, 38, 69
Solen 27
spiralis Prosipho 10, 57
spirigera Puncturella 37
Spongiobranchæa 64
squamifers Patella 43
Staurodoris 65
strigilis Patella 42
Stilbocarpa 62
Stilifer 13, 50, 70
stillwelli Pseudokellya 11, 13, 31, 69
strebeli Eumeta 9, 49, 70
stygma Acanthochiton 34
subantarctica Chlamys 16, 23, 69
subantarctica Rissoa 49
subantarctica Schismope 16, 36, 69
subatrata Plaxiphora 36
Submargarita 7, 8, 9, 13, 38, 69
Subonoba 8, 9, 47, 48, 70
subsulcata Cytherea 33
superba Plaxiphora 15, 36

Tatea 16, 46, 70
Tellimya 32
Tellina 29
tenerum Neobuccinum 58
tenerum Probuccinum 58
tenuistriatum Probuccinum 11, 58, 70
Thesbia 58
Thracia 10, 12, 13, 29
thielei Minolia 11, 39, 69
Thoristella 15, 39
Toledonia 8, 9, 11, 63, 70
Torellia 50
trapesina Gaimardia 16, 25, 69
trapezina modiola 25
trapezina Modiolarca 15, 25
trapezina Phaseolicama 25
Trichoconcha 10, 11, 12, 50
Trichotropis 11, 50
Tritoniella 8, 10, 66
Trochaclis 13, 51

PAGE.
Trochus 40
Trophon 7, 8, 9, 10, 11, 12, 16, 60, 61, 70
truncata Mya 27
truncata Mysella 29
tuberculata Archidoris 65
tumida Mammillaria 51
tumida Philippiella 20
Turbonilla 16, 62, 63, 70
turqueti Lamellariopsis 53
turqueti Montaguia 32

uber Natica 51
ungulata Philippiella 20

Valvatella 37, 38, 39
vanhoffeni Harpovoluta 11, 12, 13, 14, 53
vanhoffeni Ptychocardia 9, 30, 31
variegata Cellana 43, 70
Venericardia 13, 14, 30, 69
Venus 33
vitella Nerita 51
vittata Natica 51
vulgata Patella 43

wandelensis Philobrya 7, 8, 9, 19
wilkesiana Subonoba 9, 48, 70

NATIONAL MUSEUM MELBOURNE

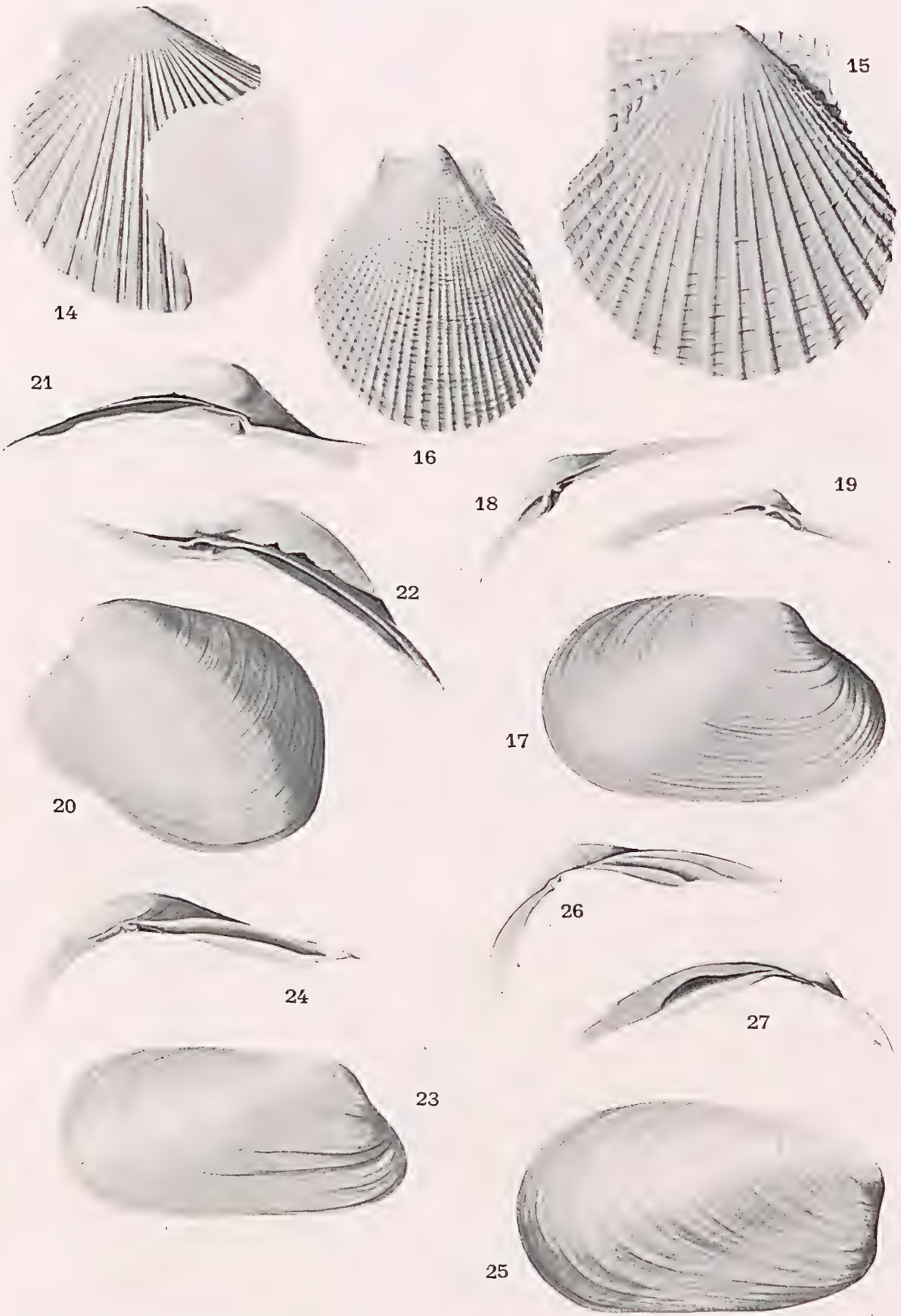
MOLLUSCA.—HEDLEY.

Phyllis T. Clarke.

SYDNEY: W. A. GULLICK, GOVERNMENT PRINTER.

NATIONAL MUSEUM MELBOURNE

MOLLUSCA.—HEDLEY.

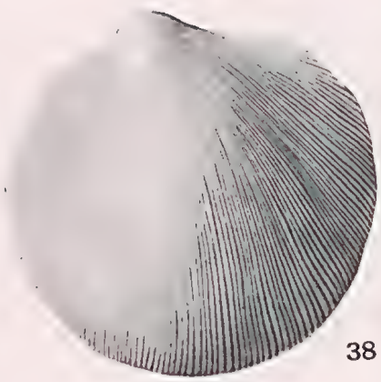


Phyllis F. Clarke.

SYDNEY: W. A. GULLICK, GOVERNMENT PRINTER.

MOLLUSCA.—HEDLEY.

39

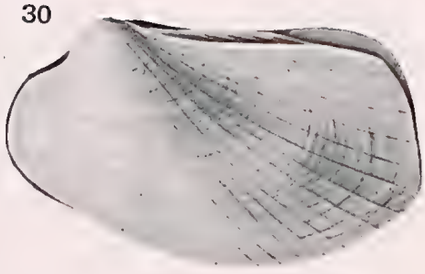


38

29

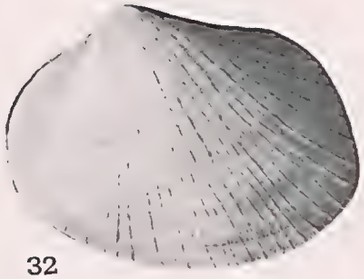
35

30

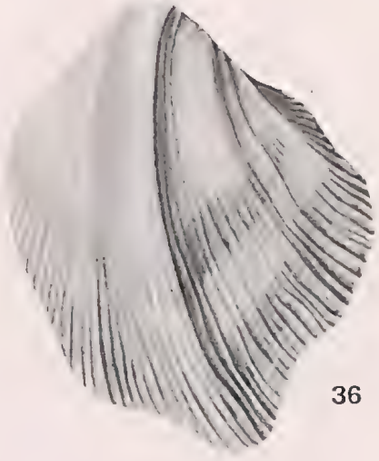


31

37

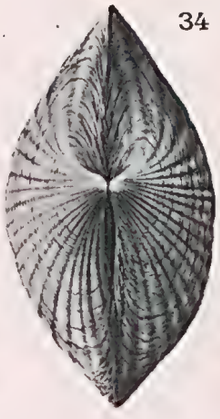


32

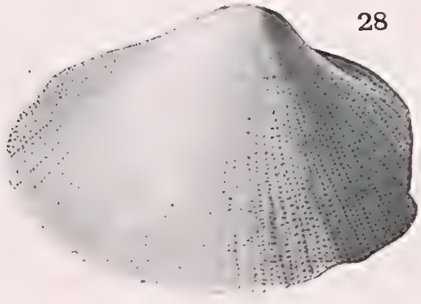


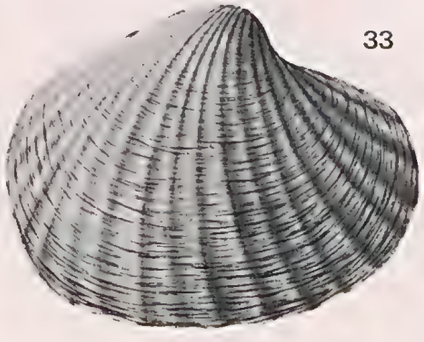
36

34



28





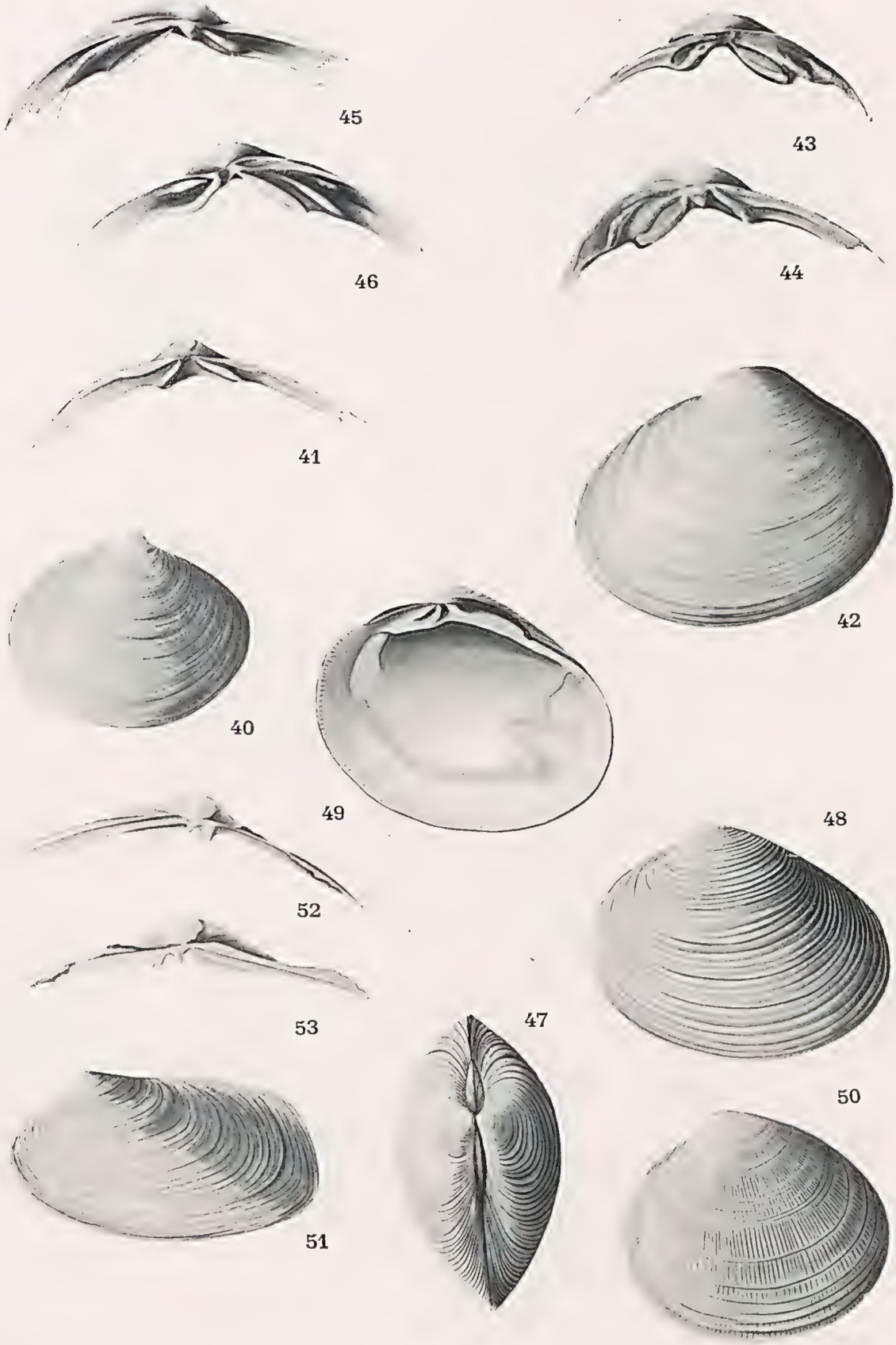
33

Phyllis F. Clarke.

SYDNEY: W. A. GULLICK, GOVERNMENT PRINTER.

NATIONAL MUSEUM MELBOURNE

MOLLUSCA.—HEDLEY.

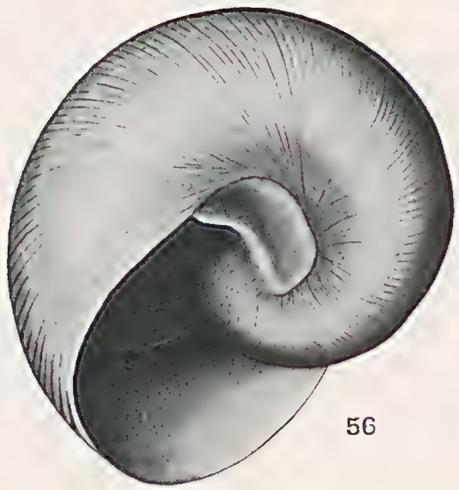


Phyllis T. Clarke.

SYDNEY: W. A. GULLICK, GOVERNMENT PRINTER.

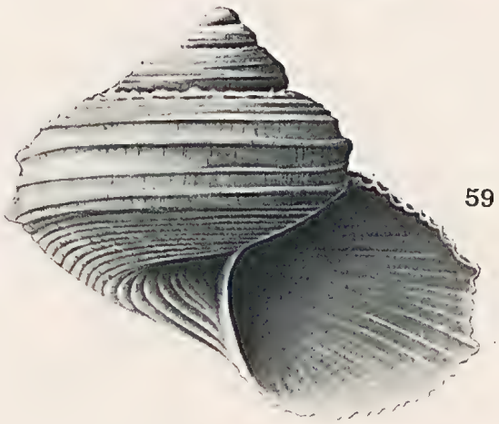
NATIONAL MUSEUM MELBOURNE

MOLLUSCA.—HEDLEY.

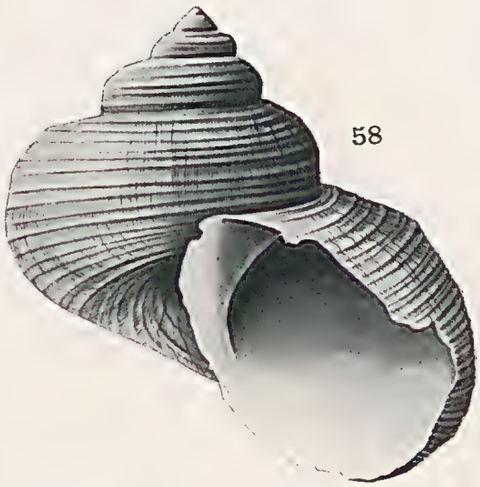


56

57



59

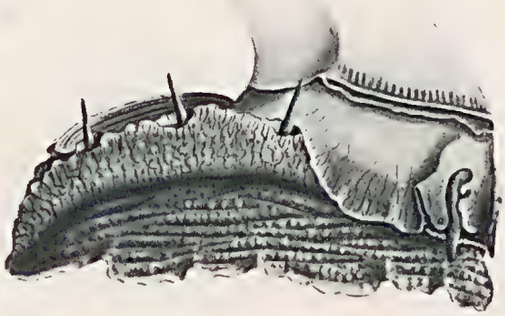


58

60

54

55



61

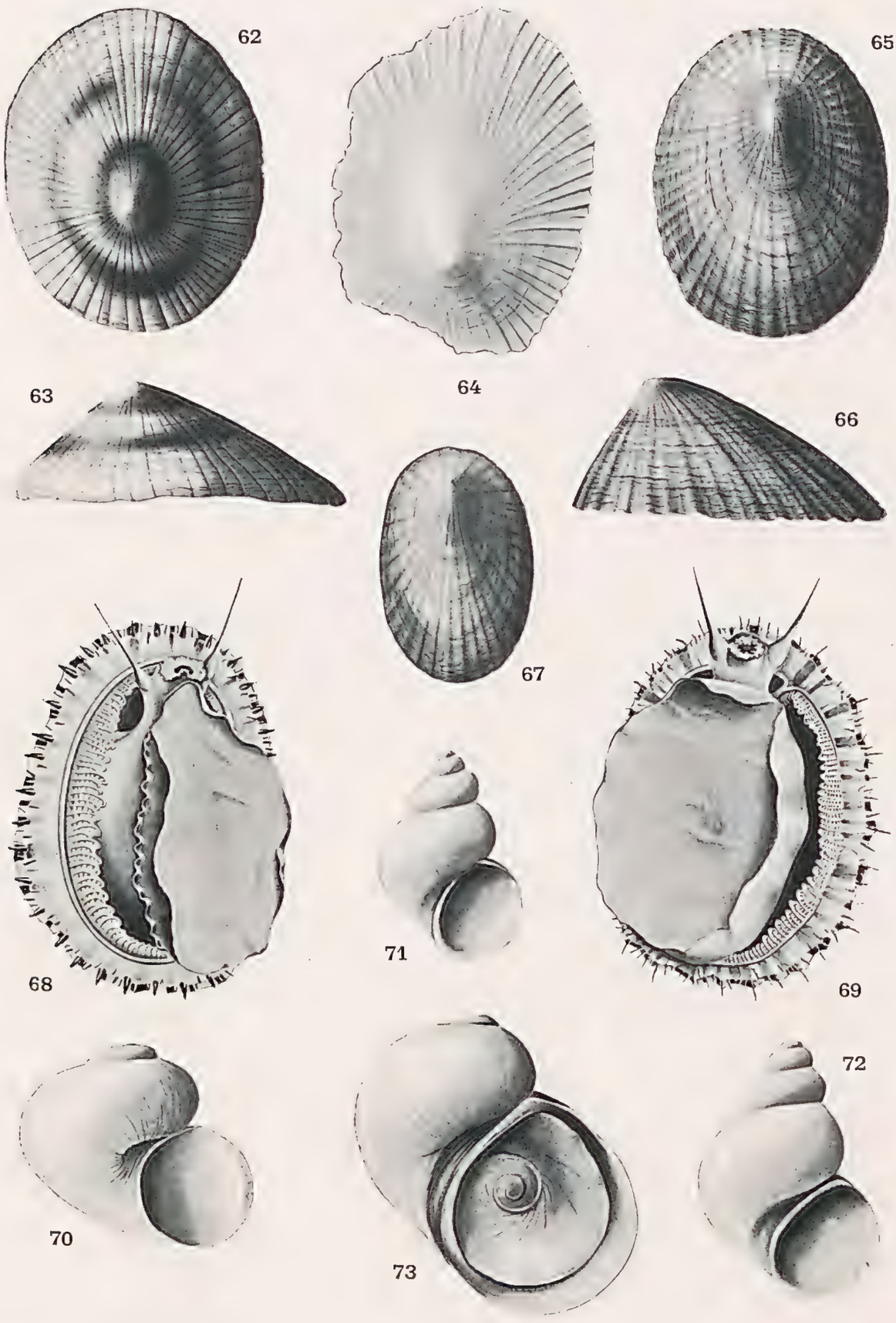
Phyllis F. Clark.

SYDNEY: W. A. GULLICK, GOVERNMENT PRINTER.

NATIONAL MUSEUM MELBOURNE

NATIONAL MUSEUM MELBOURNE

MOLLUSCA.—HEDLEY.

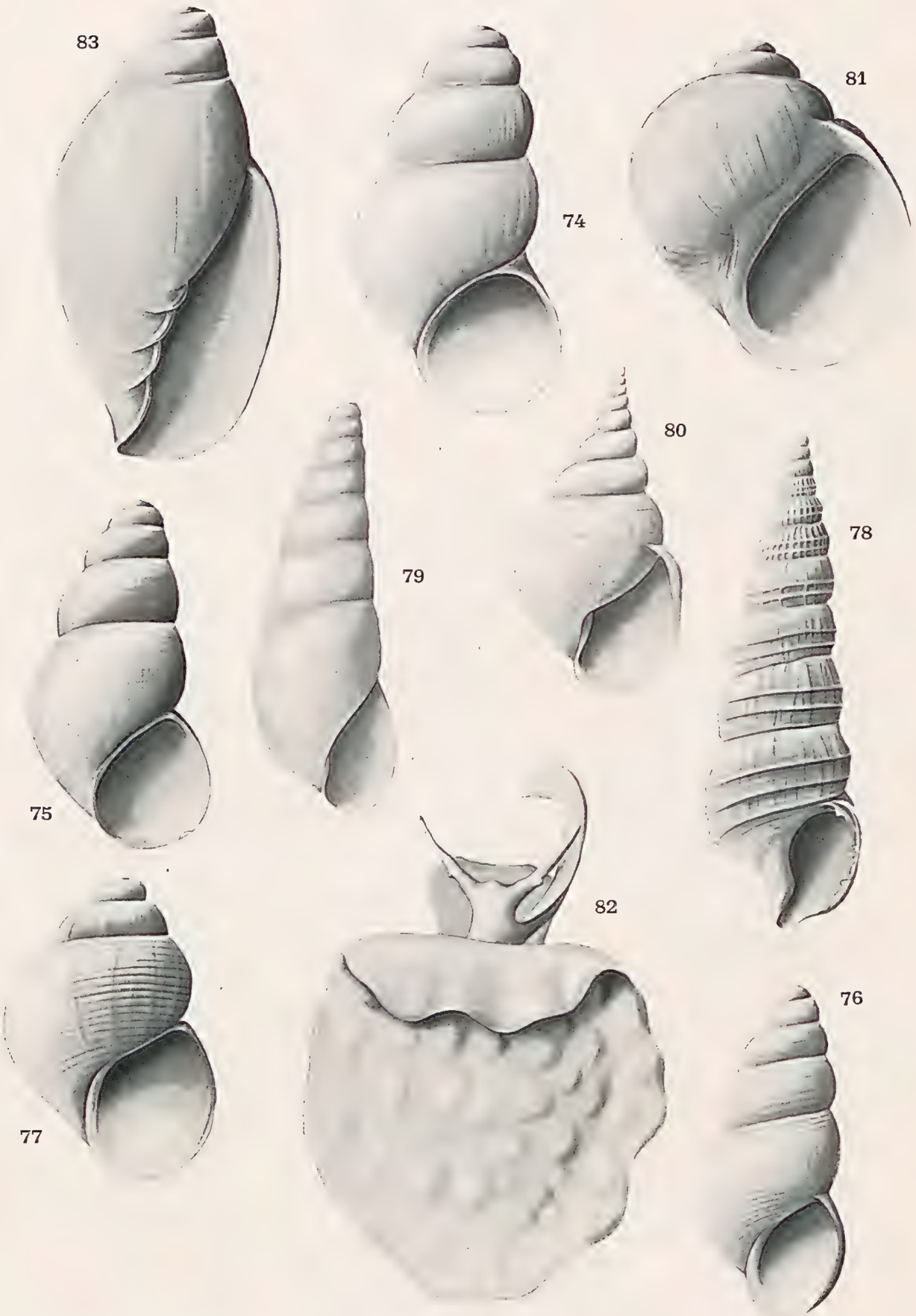


Phyllis V. Clarke.

SYDNEY: W. A. GULLICK, GOVERNMENT PRINTER.

NATIONAL MUSEUM MELBOURNE

MOLLUSCA.—HEDLEY.



Phyllis F. Clarke.

SYDNEY: W. A. GULLICK, GOVERNMENT PRINTER.

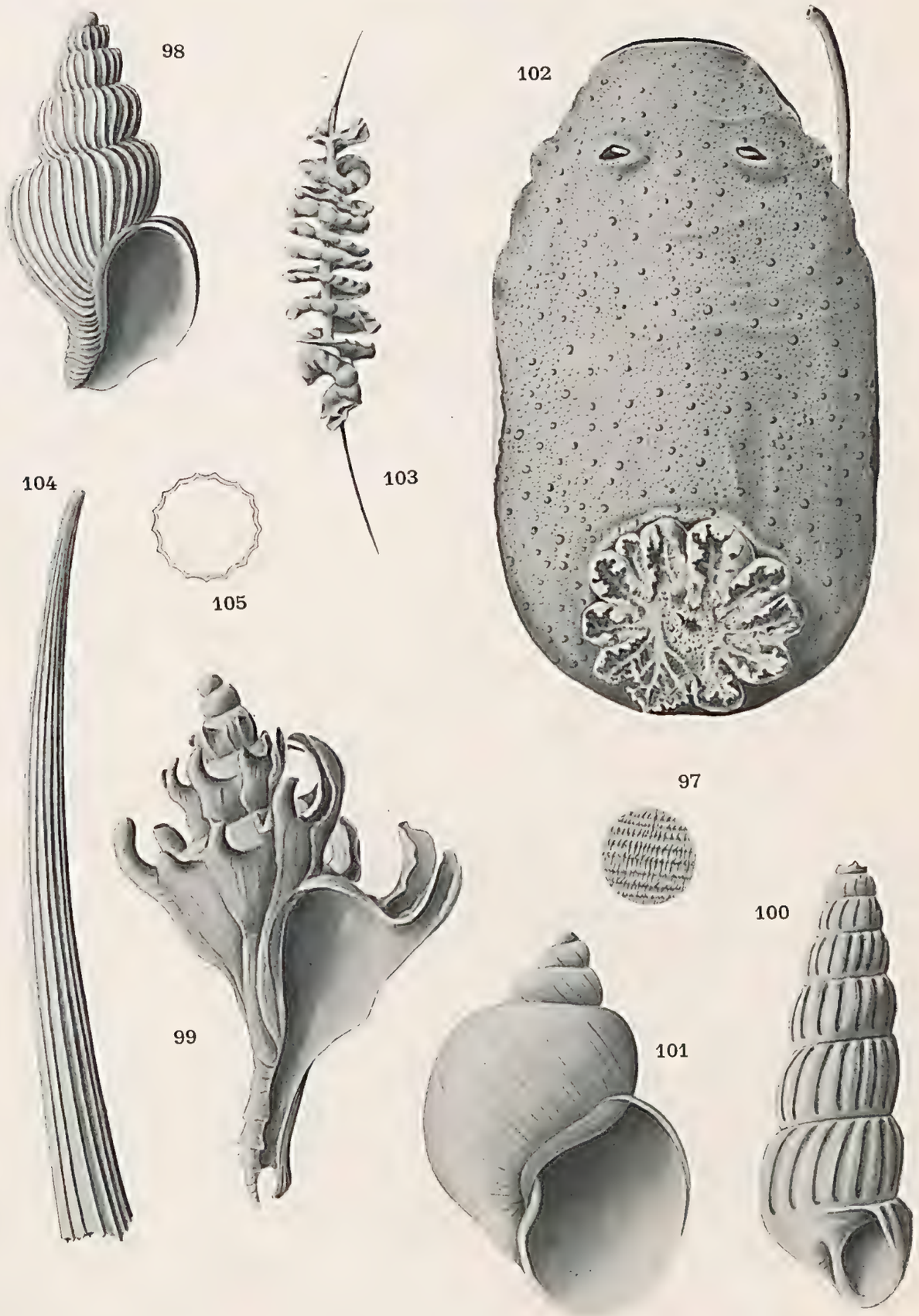
MOLLUSCA.—HEDLEY

Phyllis T. Clarke

SYDNEY: W. A. GULLICK, GOVERNMENT PRINTER.

NATIONAL MUSEUM MELBOURNE

MOLLUSCA.—HEDLEY.



Phyllis F. Clarke.

SYDNEY: W. A. GULLICK, GOVERNMENT PRINTER

NATIONAL MUSEUM MELBOURNE

Series C.—REPORTS IN COURSE OF PREPARATION.

ZOOLOGY.

FORAMINIFERA	Mr. F. Chapman, A.L.S., F.R.M.S., National Museum, Melbourne.
MONAXONID SPONGES AND TETRAXONID SPONGES	Mr. E. F. Hallmann, B.Sc., University, Sydney.
HEXACTINELLID SPONGES	Prof. I. Ijima, College of Science, Tokyo, Japan.
CALCAREOUS SPONGES	Prof. A. S. Dendy, F.R.S., D.Sc., F.Z.S., King's College, London.
HYDROZOA	Mr. E. A. Briggs, B.Sc., Australian Museum, Sydney.
ACTINOZOA	Prof. J. Arthur Thomson, F.R.S., University, Aberdeen.
TREMATODES	Dr. S. J. Johnston, University, Sydney.
CESTODES	Dr. T. Harvey Johnston, University, Brisbane.
NEMATODES (FREE)	Dr. N. A. Cobb, Bureau of Plant Industry, Washington, U.S.A.
CHÆTOGNATHA AND ACANTHOCEPHALA	Dr. T. Harvey Johnston, University, Brisbane.
ROTIFERA AND TARDIGRADA	Mr. J. Shephard, Melbourne.
ECHINOIDEA	Prof. R. Koehler, Université, Lyon, France.
ASTEROIDEA AND OPHIUROIDEA	Prof. R. Koehler, Université, Lyon, France.
CRINOIDEA AND HOLOTHUROIDEA	Prof. M. Vaney, Université, Lyon, France.
ANNULATA (EXCEPT LEECHES)	Prof. W. B. Benham, M.A., D.Sc., F.R.S., University of Otago, Dunedin, New Zealand.
LEECHES	Chas. Badham, B.Sc., University of Sydney.
CRUSTACEA COPEPODA AND OSTRACODA	Dr. G. S. Brady, F.R.S., Sheffield, England.
CRUSTACEA CUMACEA	Dr. W. T. Calman, British Museum, London.
CRUSTACEA SCHIZOPODA	Dr. W. M. Tattersall, University Museum, Manchester, England.
CRUSTACEA AMPHIPODA AND C. ISOPODA	Prof. C. Chilton, M.A., D.Sc., F.L.S., Canterbury College, Christchurch, New Zealand.
CRUSTACEA MACRURA AND C. CIRRIPEDA	Miss F. Bage, M.Sc., F.L.S., University, Brisbane.
CRUSTACEA BRACHYURA	Miss M. J. Rathbun, United States National Museum, Washington, U.S.A.
MALLOPHAGA	Dr. T. Harvey Johnston, University, Brisbane, and Mr. L. Harrison, B.Sc., Sydney.
SPIDERS	Mr. W. J. Rainbow, F.E.S., F.L.S., Australian Museum, Sydney.
TICKS	Mr. L. Harrison, B.Sc., Sydney.
PYCNOGONIDA	Prof. T. T. Flynn, B.Sc., University of Tasmania, Hobart.
*MOLLUSCA PELECYPODA AND GASTROPODA	Mr. C. Hedley, F.L.S., Australian Museum, Sydney.
MOLLUSCA CEPHALOPODA	Dr. S. S. Berry, Redlands, California, U.S.A.
BRACHIOPODA	Dr. J. A. Thomson, Dominion Museum, Wellington, N.Z.
TUNICATES	Prof. W. A. Herdman, F.R.S., University, Liverpool, England.
CEPHALODISCUS	Mr. R. Ridewood, B.Sc., British Museum.
BIRDS	Mr. H. Hamilton, Dominion Museum, Wellington, N.Z., and Mr. R. Basset Hull, Sydney.
MAMMALS	Mr. H. Hamilton, Dominion Museum, Wellington, N.Z.

BOTANY.

MOSSES	Rev. W. W. Watts, Sydney.
PHYTOPLANKTON AND FRESH-WATER ALGÆ	Prof. F. E. Fritsch, University of London.
LICHENS AND FUNGI	Mr. E. Cheel, Botanic Gardens, Sydney.
MARINE ALGÆ	Mr. A. H. S. Lucas, M.A., B.Sc., Grammar School, Sydney.
VASCULAR PLANTS	Mr. T. F. Cheeseman, F.L.S., F.Z.S., Auckland Museum, N.Z.

* Issued.

NATIONAL MUSEUM, MELBOURNE

AUSTRALASIAN ANTARCTIC EXPEDITION

1911 - 1914.

UNDER THE LEADERSHIP OF SIR DOUGLAS MAWSON, D.Sc., B.E.

SCIENTIFIC REPORTS.

SERIES C.--ZOOLOGY AND BOTANY.

VOL. IV. PART 2.

CEPHALOPODA

BY

S. STILLMAN BERRY, A.M., Ph.D.,

REDLANDS, CALIFORNIA.

WITH FIVE PLATES AND THIRTY FIGURES IN THE TEXT.

PRICE THREE SHILLINGS AND SIXPENCE.
TO SUBSCRIBERS: THREE SHILLINGS.

Printed by R. E. E. Rogers, Government Printer, North Terrace, Adelaide, South Australia.

ISSUED MARCH 31ST, 1917.

Series C.—REPORTS ALREADY ISSUED.

ZOOLOGY.

Vol.	Part.		Price. s.	d.
III.	1.	FISHES. By Mr. Edgar R. Waite, F.L.S., South Australian Museum, Adelaide	8	6
IV.	1.	MOLLUSCA;—PELECYPODA AND GASTROPODA. By Mr. C. Hedley, F.L.S., Australian Museum, Sydney	8	6

NATIONAL MUSEUM MELBOURNE

AUSTRALASIAN ANTARCTIC EXPEDITION

1911 - 1914.

UNDER THE LEADERSHIP OF SIR DOUGLAS MAWSON, D.Sc., B.E.

SCIENTIFIC REPORTS.

SERIES C.—ZOOLOGY AND BOTANY.

VOL. IV. PART 2.

CEPHALOPODA

BY

S. STILLMAN BERRY, A.M., Ph.D.,

Redlands, California.

With Five Plates and Thirty Figures in the Text.

South Australia:

R. E. E. Rogers, Government Printer, North Terrace, Adelaide.

ISSUED MARCH 31st, 1917.

CONTENTS.

Introduction.—Historical Survey.—Resumé of the Present Collection.—Family Cirroteuthidæ.—Family Polypodidæ.—Key to Antarctic Species of Moschites.—Family Brachioteuthidæ.—Indeterminable Material and Fragments.

CEPHALOPODA.

By S. Stillman Berry, A.M., Ph.D., Redlands, California.

INTRODUCTION.

Through the courtesy of Mr. Charles Hedley, of the Australian Museum, Sydney, and its Director, Mr. R. Etheridge, there was placed in my hands for study the collection of cephalopods obtained in the course of the scientific explorations carried on by the Australasian Expedition to the Antarctic in the ship "Aurora," in the years 1911 to 1914, under the leadership of Sir Douglas Mawson. These form the subject of the present report.

The collection is rather a small one, yet in point of numbers comprises one of the most extensive series of cephalopods which has been obtained in Antarctic waters. For one reason and another none of the previous expeditions to this region of the globe have been very fortunate along this line, so that even in its entirety the known fauna offers few outstanding features other than a striking predominance of octopods. While this seems partly to have been due to the relative ease with which these forms may be trapped, the more agile decapods escaping the methods available to even the better-equipped exploring expeditions, a further reason probably lies in the fact that, as pointed out later on, the Antarctic is the metropolis of the genus *Moschites*.

Consequently the rather formidable bibliography of Antarctic cephalopods resolves itself into a somewhat monotonous catalogue of fragments, stomach contents, penguin ejecta, and scattered specimens, with little to suggest any broad facts of distribution or other generalizations, or to furnish much of a basis for further investigation. It should not be anticipated that the material now brought together for consideration serves in any way to revolutionize this state of affairs, for, like the previous collections it represents but a nibble here and a nibble there, though it is happily from regions (off the coasts of Adelie Land and Queen Mary Land) from which, heretofore, nothing has been known, and the very fair number of well-preserved specimens gives at least a hint of what to expect when a special effort is made to secure these animals, using both apparatus and methods adapted to the end in view. However, we may still affirm that the fauna shows no evident relation to that of the Arctic save a superficial resemblance or *facies*, due, no doubt, to the similarity in physical environment. In

passing, it may be noted as an interesting fact that, so far as I can discover, not a species of cephalopod is known to be truly bipolar in distribution. In the same connection comparison should be made with the conclusions of Thompson ('98).

For maps, collecting data, and other relevant details useful in connection with the facts of the present paper, the student is referred to the two fascinating volumes of " The Home of the Blizzard " (Mawson, :15), wherein Dr. Mawson and his collaborators treat of the difficulties of Antarctic exploration and the various phases of their remarkably many-sided expedition in a most illuminating way.

HISTORICAL SURVEY.

Though so little is known of the Antarctic fauna, the records of cephalopods are sufficiently numerous and scattered that a brief summary may be useful. Adopting the 60th parallel as an arbitrary boundary, except where there seems good reason to include slightly extra-limital records, the following list is thought to be practically complete. Full citations of the reports quoted will be found in the bibliography.

1874. " Challenger." (Hoyle '85, '85A, '86.)

Eledone rotunda Hoyle n. sp., 1,950 fathoms, Lat. South 53° 55′, Long. East 108° 35′.

1898–99. " Belgica." (Joubin :03.)

Fragments only.

1904. " Français " (Charcot Expedition). (Joubin :05, :06.)

Eledone charcoti Joubin n. sp., beach, Booth Wandel Island.

Eledone turqueti Joubin n. sp., 25m., off Booth Wandel Island.

1901–02. " Discovery." (Hoyle :07.)

Larval Histioteuthid, Lat. South 54° 01¼′, Long. East 170° 49′.

Fragments.

1898. " Valdivia." (Chun :10.)

Taonius pavo (Lesueur), from stomach of albatross, Lat. South 58° 52′, Long. East 43°.

Crystalloteuthis glacialis Chun n. sp., 1,500m., Lat. South 59° 16′, Long. East 40° 13′.

Teuthowenia antarctica Chun n. sp., 2,000m., Lat. South 55° 57′, Long. East 16° 14′.

1903–04. "Scotia." (Hoyle :12.)

Stauroteuthis species, 2,425 fathoms, Lat. South 66° 40′, Long. West 40° 35′, Weddell Sea.

Moschites charcoti (Joubin), 10 fathoms, Scotia Bay, South Orkneys.

Onychoteuthis ingens Smith, Scotia Bay, South Orkneys; also from stomach of Ross's seal, off the South Orkneys.

Bathyteuthis abyssicola Hoyle, Lat. South 71° 22′, Long. West 18° 15′, off Coats Land.

Galiteuthis suhmi Hoyle, Lat. South 68° 32′, Long. West 12° 49′, Weddell Sea.

RESUMÉ OF THE PRESENT COLLECTION.

As it came into my hands, the Australasian collection contained, besides the usual large array of indeterminable fragments taken from the stomachs of various vertebrates, some 14 preserved animals, most of them in a very good state of preservation. Two, though clearly neither conspecific nor congeneric with any of the remainder, are not specifically determinable. A third, a small shallow-water *Polypus* from the Tasmanian coast, is named only with considerable doubt, and should be included only by sufferance in an Antarctic report. The remaining 11 specimens are all octopods and referable to five species, four of them members of the genus *Moschites*. After as careful study as the literature alone will permit in the total absence of comparative material, all of these species are thought to be new, and are herein described under the following names:—

Stauroteuthis mawsoni n. sp.

Moschites albida n. sp.

" *adelieana* n. sp.

" *auroræ* n. sp.

" *harrissoni* n. sp.

A more or less critical comparison with previously described forms will be given in the consideration of each species as dealt with.

Most of the drawings used to illustrate this paper are from the careful pen of Mr. E. Russell Lord-Wood, of Redlands, California. For the four drawings of funnel organs, however (figs. 6, 10, 14, and 21), acknowledgment is due to my friend, Mr. Robert N. Wenzel, of Stanford University.

Class CEPHALOPODA.

Order DIBRANCHIATA.

Suborder OCTOPODA.

Family Cirroteuthidæ.

Genus Stauroteuthis *Verrill*, 1879.

1.—Stauroteuthis (?) mawsoni *n. sp.*

(Pl. X., fig. 1.)

Description :

Body relatively firm, smooth, almost sepioliform; strongly compressed dorso-ventrally, well rounded below, but only very slightly arched above the fins. Fins very large, almost as long as the mantle at their base, where they are firmly attached, thence

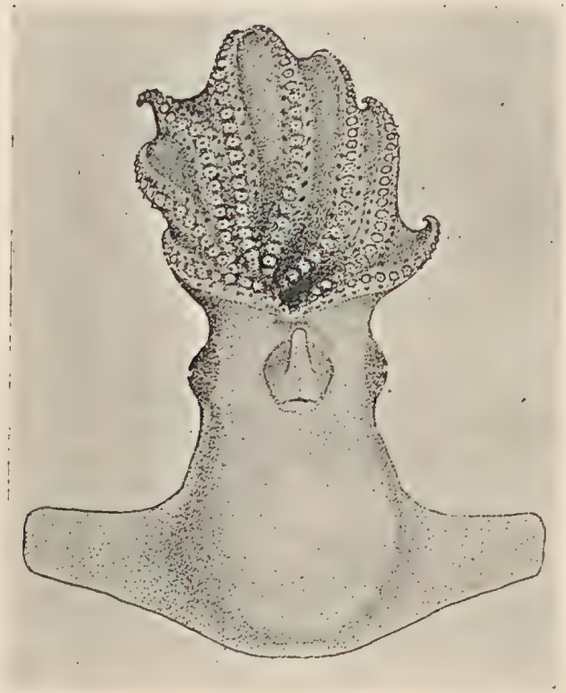


Fig. 1.—*Stauroteuthis mawsoni.*

Type × 3.

tapering slightly to their somewhat truncate and squared extremities. Each separate fin almost as wide as the body; anterior margins nearly straight and extending practically at right angles to the longitudinal axis of the body; posterior margins tending obliquely backward until they become continuous with one another around the posterior region of the mantle by means of a conspicuous broad flat fold of the integument, traces

of a much narrower but similar fold extending from the anterior margins toward the eyes. Pallial aperture very narrow, nearly circular, and closely encompassing the small short funnel.

Head about as wide as the body and not well delimited from it.

Arms about equal in length to the head and body taken together; unequal, the formula quite distinctly 1, 2, 3, 4. Each bears along its oral face a single series of small, closely placed, discoid suckers, flanked on either side by a series of short, blunt, cylindrical, papilliform cirri, which commence at the second or third sucker from the base, continuing

Fig. 2.—*Stauroteuthis mawsoni.*
Lateral view. × 3.

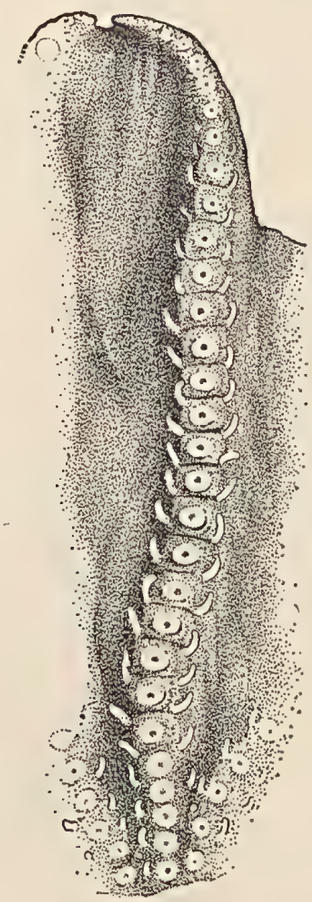


Fig. 3.—*Stauroteuthis mawsoni.*
Oral aspect of left dorsal arm. × 7.

in alternation with the suckers nearly to the tips of the arms. Umbrella thin and delicate, but ample, especially between the dorsal arms, which it connects nearly to their extremities; slightly less extensive between the dorsal and second arms and laterally, becoming emarginate between the arms of the ventral pair nearly half way to the base. The umbrella is attached to the arms in the ordinary way and there is no intermediate web. Suckers little elevated, apertures minute, the rims wide and flattened, with rather indistinct traces of radial fluting. (Text fig. 4.)

Color in alcohol a pale brownish cream; the eyes and oral aspect of the umbrella slate colored; while the few remaining fragments of the original integument are of a dark reddish hue.

Measurements :	mm.
Total length	32
Edge of posterior fold to base of dorsal arms	15
Width of body	9
Width across fins	28
Width of single fin	8
Median length of fin	6·5
Maximum width of posterior fold	3
Width across neck	8
Width across eyes	9
Length of funnel	3·5
Length of dorsal arms	17

Type.—Cat. No. C. 40886 of the Australian Museum [S.S.B. 447].

Type Locality.—Station II., Lat. South 66° 55′, Long. East 145° 21′, 288-300 fathoms, ooze bottom, off the Mertz Glacier Tongue, Adelie Land; bottom temp. −1·8° C.; December 28th, 1913; one specimen, in company with *Moschites adelieana.*

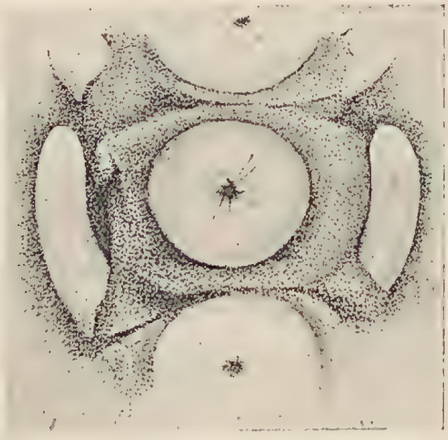


Fig. 4.—*Stauroteuthis mawsoni.*
Sucker 11 of right dorsal arm. × 36.

Remarks.—As the single specimen seems doubtless a very young one, there has been some natural hesitation about naming and describing it, but the possession of the curious posterior fold, a very singular feature in this group of cephalopods, and the excellent preservation of the creatures seem decisive for the wisdom of this course. The longer body, much larger fins, and more anterior position of the eye amply distinguish this specimen from the Kermadec Island juvenal identified with his *S. meangensis* by Hoyle ('86, p. 65, pl. 9, figs. 12, 13), and I have encountered nothing else in the literature suggesting the necessity of special comparison.

Careful removal and dissection of the entire buccal mass of this animal have failed to reveal the presence either of an odontophore or of any structure thought to be homologous with the same, though the minute size and very brittle consistency of the parts in question unfortunately preclude absolute certainty in the matter. A certain special significance is thus afforded the specimen in the consideration of the writer, as it is the first Cirroteuthid he has encountered in which he has been unable to detect a radula, an organ the absence of which was formerly supposed to be a family peculiarity.

Not wishing further to mutilate a type specimen, I have forborne any dissection of the dorsal cartilage. Hence the reference of the species to the genus *Stauroteuthis* must remain for the present somewhat provisional.

In the specific name adopted it becomes a pleasurable courtesy to dedicate this curious and interesting creature to the leader of the Expedition, Sir Douglas Mawson.

Family Polypodidæ.

Genus Polypus *Schneider*, 1784.

2.—? Polypus duplex (*Hoyle*, 1885).

? 1885. *Octopus duplex* Hoyle, Ann. & Mag. Nat. Hist., (5), v. 15, p. 226.

? 1886. " Hoyle, Rep. Ceph. " Challenger," p. 90, pl. 7, fig. 5.

Material.—A single immature female, taken by the " Aurora " in 65 fathoms, off Maria Island, Tasmania, December 12th, 1912 [S.S.B. 448].

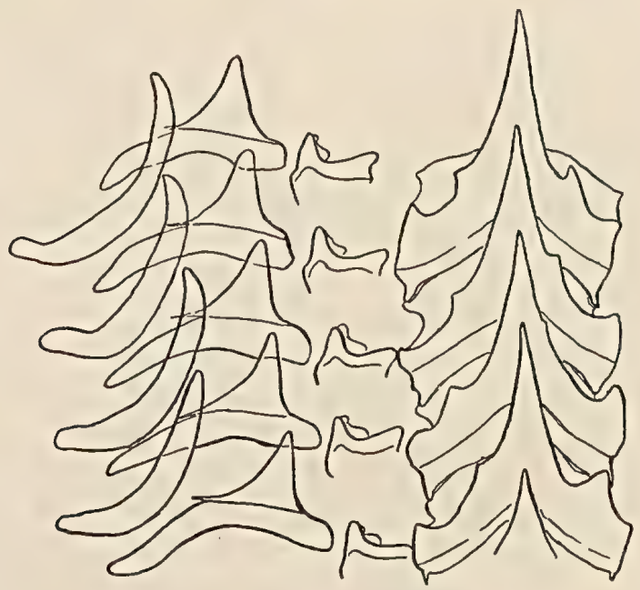


Fig. 5.—*Polypus* (*duplex* ?).

Radula.

Remarks.—This specimen is rather small for positive determination, but is in fair accord with the description of Hoyle's *O. duplex*, from Twofold Bay, Australia. The following are the more important of the observed discrepancies:—

(1) The specimen shows only one instead of three tubercles over each eye.

(2) Though for the most part smooth, there are places where the dorsum shows faint traces of papillation.

(3) I find no evidence of the existence of "an interrupted ridge . . . . . along the ventro-lateral margin of the body."

(4) The color is a dark slate grey above, giving way laterally and ventrally to a light brownish cream.

As a possible future aid in confirming or rejecting the identification, a portion of the radula is illustrated in text fig. 5.

Measurements:	mm.
Total length	100
Tip of body to dorsal base of umbrella	32
Length of body (dorsal)	24
Width of body	19
Width of neck	10
Width across eyes	14
Length of funnel	9
Mouth to tip of right dorsal arm	64
Mouth to tip of left dorsal arm	64
Mouth to tip of right second arm	71
Mouth to tip of left second arm	72
Mouth to tip of right third arm	68
Mouth to tip of left third arm	66
Mouth to tip of right ventral arm	71
Mouth to tip of left ventral arm	68
Length of umbrella between dorsal arms	16
Length of umbrella between ventral arms	17

Genus Moschites *Schneider*, 1784.

A list of the described species of this genus, with an indication of their known distribution, is as follows:—

1. *M. cirrhosa* (Lamarck, 1799)..... Norway to Mediterranean.
2. *M. moschata* (Lamarck, 1799) ..... Mediterranean.

— M. aldrovandi (Rafinesque, 1814) = *M. cirrhosa.*

— M. ventricosa (Grant, 1827) ..... = *M. cirrhosa.*

— M. pennantii (MacGillivray, 1843) = *M. cirrhosa.*

— M. genei (Vérany, 1851)..... = *M. cirrhosa.*

3. *M. verrucosa* (Verrill, 1881) ..... 466–1,255 fath., off East Coast of United States.*

— *M. halliana* (de Rochebrune, 1884) = *M. cirrhosa* ? **

4. *M. rotunda* (Hoyle, 1885) ..... 1,950 fathoms, Southern Ocean, Lat. South 53° 55′, Long. East 108° 35′ (also off Valparaiso ?).

5. *M. brevis* (Hoyle, 1885) ..... 600 fathoms, off Monte Video.

6. *M. charcoti* (Joubin, 1905)..... Antarctic (beach, Booth Wandel Island; 10 fathoms, Scotia Bay, South Orkneys).

7. *M. turqueti* (Joubin, 1905)..... Antarctic (25 fathoms, off Booth Wandel Island).

8. *M. nigra* (Hoyle, 1910) ..... Angra Pequeña, South-west Africa.

9. *M. challengeri* (Berry, 1916) ..... 630 fathoms, off the Kermadec Islands.

To the above are now added the following Antarctic forms :—

10. *M. albida* n. sp. ..... 1,700 fathoms, off Wilkes Land.

11. *M. adelieana* n. sp. ..... 300 fathoms, off Adelie Land.

12. *M. aurorœ* n. sp. ..... 120–325 fathoms, off Queen Mary Land.

13. *M. harrissoni* n. sp. ..... 270–358 fathoms, off Queen Mary Land.

The genus is in certain respects a difficult one, and not even its European representatives have been thoroughly worked out until very recently. Its metropolis, however, appears to be not the Mediterranean, as formerly believed, but the Antarctic, where the group would seem nearly or wholly to replace the otherwise cosmopolitan genus *Polypus*. An explanation of the apparently complete absence of the latter genus from the waters surrounding the Antarctic Continent, when it is so abundantly represented in the entire South Pacific, Australian, South African, and South American regions, is difficult to seek.

---

* The Pacific records of this species appear to me exceedingly dubious.

** I follow Naef's treatment of the European forms, but cannot find that he mentions *M. halliana.*

A key to the seven species of *Moschites* having an austral distribution is here appended. Though probably too artificial to be of permanent value, it may prove temporarily useful.

Key to the Antarctic Species of Moschites.

1. Body smooth or only faintly papillose; no permanent warts or tubercles.

2. Body smooth; without a peripheral fold.

3. Umbrella very short; eyes enormous, practically adnate; funnel organ W-shaped ..... *adelieana.*

3¹. Umbrella well developed; eyes moderately large and prominent, but not adnate.

4. Arms relatively short, but about twice as long as body; coloration dark ..... *rotunda.*

4¹. Arms relatively long, four times the length of the body; funnel organ broad, V-shaped; abyssal species of pale coloration ..... *albida.*

2¹. Body faintly papillose, or with low scattered papillæ.

5. A subperipheral fold present; surface with low, scattered papillæ; arms short, about two and a half times the length of the body; umbrella short; funnel organ duplex, with separate U-shaped components ..... *harrissoni.*

5¹. No subperipheral fold; surface faintly papillose or nearly smooth; arms very short, less than twice the length of the body; suckers of ventral arms biserial ..... *turqueti.*

1¹. Body heavily papillose and with distinct supraocular tubercles; arms short, about twice as long as body.

6. Two tubercles above each eye and a few others scattered over body; papillæ of general surface small; a distinct subperipheral fold present; eyes large; umbrella well developed; funnel organ duplex, the components V-shaped ..... *auroræ.*

6¹. One low tubercle over each eye; papillæ of general surface large and coarse; no peripheral fold present (?); eyes moderate.... *charcoti.*

3.—Moschites albida *new species.*

(Pl. X., figs. 2 and 3 ; Pl. XI., fig. 4.)

Description :

Body firm, slightly compressed and with a faint longitudinal groove below, but nearly round from the dorsal aspect, being a little broader than long. Mantle opening extending somewhat over a third of the distance around the head, terminating at a point below, but distinctly in front of the eye aperture.

Head extremely short and broad, but narrower than the body, from which it is very poorly if at all delimited. Eyes moderately large, but not greatly swollen.

Funnel short and stubby, but not very broad at the base, whence it extends a little over a third of the distance to the umbrella margin. Funnel organ large, with a very rugose or plicate surface in preserved material, having a general outline like that of a very broad-limbed V, and covering almost the entire wall of the funnel cavity (text fig. 6).

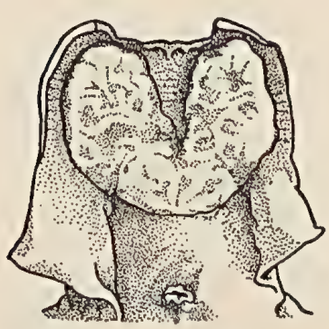


Fig. 6.—*Moschites albida.*

Funnel of type. × 2.

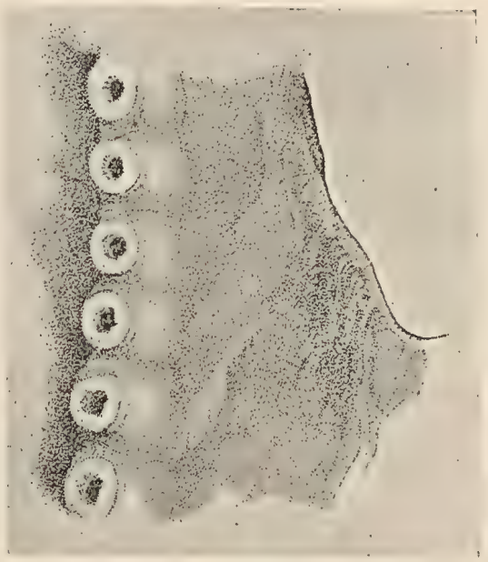


Fig. 7.—*Moschites albida.*

Suckers 9-14 of right dorsal arm. × 3.

Arms roughly subequal, their length not quite four times that of the body or three times that of the head and body taken together ; very stout, little attenuate. Suckers uniserial (text fig. 7), the small deep cups having the appearance of closer ranking toward the tips of the arms than near the mouth. The number of suckers to be counted by the unaided eye is about 57 on the right third arm. Umbrella rather thin, but well developed, especially at the sides where it extends for more than a third the length of the arms ; its least development occurs between the arms of the ventral pair.

Hectocotylus unknown.

Surface everywhere smooth, the few wrinkles present being obviously due to contraction consequent to preservation. Integument colorless, thin, delicate, very loosely adherent, and hence easily delaminated from the subjacent tissues, especially between the arms.

Color of the alcoholic specimen, everywhere a livid greyish-white, the eyeballs showing slaty purple through the supervening tissues.

Mandibles stout and black, their general outline as in the figure (text fig. 8).

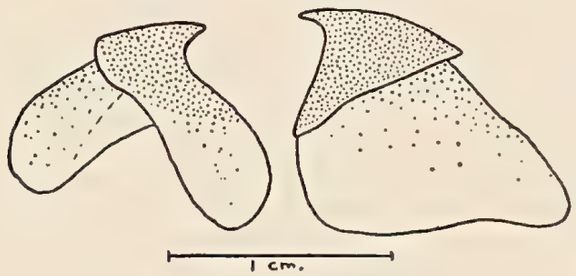


Fig. 8.—*M. albida.*

Mandibles.

Radula relatively delicate and transparent, taking stain (an aqueous solution of potassium bichromate) with difficulty. Rhachidian teeth more or less hat-shaped, broadly flaring at the base, and with sharp, simple, regularly tapering points. First laterals weak, blunt, squarish, their outer angles more conspicuously developed than their inner. Second and third laterals better developed, their large teeth resembling one another in size and in their nearly triangular outline. (Text fig. 9.)

Measurements :	mm.
Total length	170
Length of body (dorsal)	35
Tip of body to base of dorsal arms	45
Width of body	40
Width of neck	29
Width across eyes	31
Length of funnel	12
Mouth to tip of right dorsal arm	105
Mouth to tip of left dorsal arm	129
Mouth to tip of right second arm	127
Mouth to tip of left second arm	124
Mouth to tip of right third arm	127
Mouth to tip of left third arm	111
Mouth to tip of right ventral arm	73+
Mouth to tip of left ventral arm	117
Length of umbrella between dorsal arms	37
Length of umbrella between ventral arms	27

Type.—Cat. No. C. 40888 of the Australian Museum [S.S.B. 436].

Type Locality.—Station V., Lat. South 64° 34′, Long. East 127° 17′, off Wilkes' Land, 1,700 fathoms, bottom of thick ooze and rocks; bottom temp. −0·3° C.; one ♀ specimen.

Fig. 9.—*M. albida.*

Radula.

Remarks.—The radula and funnel organ of this species are wholly unlike those of any other *Moschites* known to me. More superficially *M. albida* appears to show relationship to another smooth deep water species, the *M. rotunda* of Hoyle, but differs from the latter only in the relatively longer arms, but more strikingly in its pale coloration. *M. turqueti* Joubin seems to be a quite different form from shallow water, and if the original specimen was an adult is a much smaller species, well distinguished by its short umbrella and crowded suckers. I rather doubt if the affinity here will prove a particularly close one.

The beak of *M. albida*, as of the remaining species to be dealt with, diverges little from the regulation type, but is figured as an admittedly uncertain aid in the determination of the numerous remains collected from the stomachs of various vertebrates in the region. The radula, fortunately, affords us better characters for this purpose.

4.—Moschites adelieana *new species.*

(Pl. XI., fig. 5; Pl. XII., figs. 6, 7, 8.)

Description:

Body rounded, compressed, very short and broad, the width about equaling the length of the body and head together; a longitudinal depression in the median line below. Pallial opening very ample, reaching a point just above the base of the eyes and well behind the plane of the eye opening.

Head quite large in comparison with the body, its size due almost wholly to the immense, swollen eyes, which nearly meet in the median line above.

Funnel cylindrical, reaching a little less than two-thirds of the distance from its base to the umbrella margin. Funnel organ well developed, W-shaped (text fig. 10).

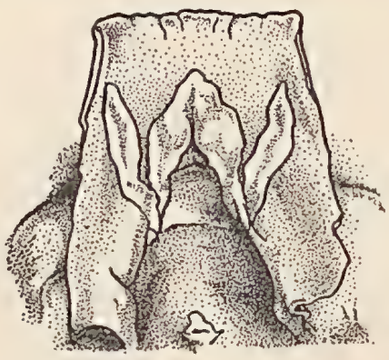


Fig. 10.—*Moschites adelieana.*

Funnel organ of type. × 3.

Arms short, scarcely twice as long as the head and body, or three times the length of the body alone; robust, their extremities little attenuate; not keeled or webbed; much compressed laterally so as to appear more or less rectangular in transection. Suckers (text fig. 11) rather large, particularly from about the 9th to the 15th from the

Fig. 11.—*M. adelieana.*

Suckers 7-10 of right dorsal arm. × 3.

base; arranged in a single series throughout, about 43 to be distinguished upon the left third arm. Umbrella very poorly developed, extending between the lateral arms, where its extent is a little the greatest, for scarcely a quarter of their length.

Hectocotylus unknown.

Surface everywhere smooth, permanent papillæ or tubercles of any description being indistinguishable.

Color in alcohol everywhere, excepting the cream-colored suckers, a dull clouded slaty grey, only slightly paler below, though quite pale under and around the funnel, and with a narrow line of paler tone traceable around the body just below the periphery in the position occupied in some species by an integumentary fold, no trace of such a fold being here evident.

Mandibles sharp, but rather thin and fragile; a good figure difficult to secure from the present material (text fig. 12).

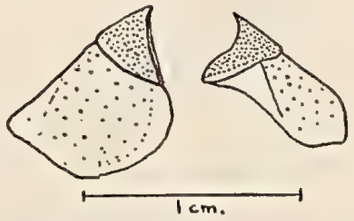


Fig. 12.—*M. adelieana.*

Mandibles.

Radula well developed. Rhachidian teeth with nearly rectangular bases and sharply tapering points, so far as I have been able to discover, without lateral cusps. First laterals small, teeth triangular. Second laterals well developed, teeth triangular, oblique. Third laterals largest, teeth long, curved, and scimitar shaped. (Text fig. 13.)

Measurements:	Type. mm.	Juv. mm.	Juv. mm.
Total length	110	18	16
Tip of body to dorsal base of umbrella	38	7	7
Length of body	25	5·5	5
Width of body	38	6	6
Width of neck	29	5	5
Width across eyes	33	6	6·5
Length of funnel	14	2	2
Mouth to tip of right dorsal arm	mutilated	7·5	9
Mouth to tip of left dorsal arm	69	10	8
Mouth to tip of right second arm	mutilated	10	9
Mouth to tip of left second arm	70	11	9
Mouth to tip of right third arm	mutilated	8	9
Mouth to tip of left third arm	74	8+	9
Mouth to tip of right ventral arm	71+	8	9
Mouth to tip of left ventral arm	76	8	9
Length of umbrella between dorsal arms	14	1	2
Length of umbrella between ventral arms	14	2	1·5

Type.—A female, Cat. No. C. 40889, of the Australian Museum [S.S.B. 438].

Type Locality.—Station II., Lat. South 66° 55′, Long. East 145° 21′, off the Mert Glacier Tongue, Adelie Land; 288-300 fathoms, ooze; bottom temp. −1·8° C.; December 28th, 1913; one adult ♀ specimen, two juvenals.

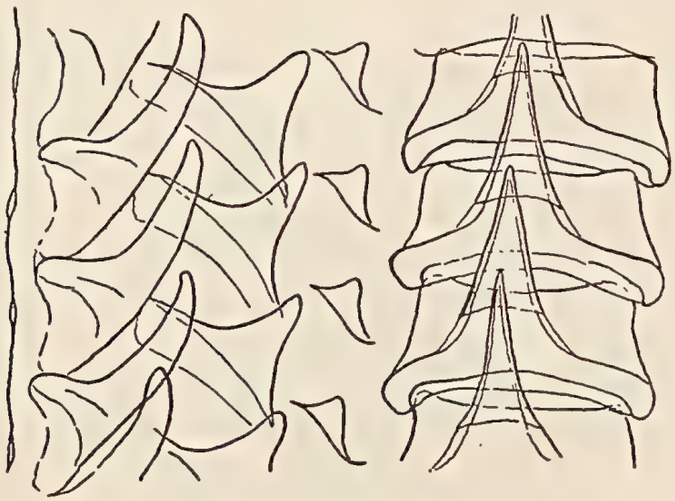


Fig. 13.—*M. adelieana.*

Radula.

Remarks.—The short wide body, enormous eyes, scanty umbrella, short robust arms, characteristic funnel organ, and distinct radula of this species are the features which more especially seem to forbid its union either with any of the previously described members of the genus or with any of the remaining forms captured by the Australasian Expedition. In many respects *M. adelieana* bears a certain resemblance to the *M. turqueti* of Joubin, but the description of the latter, though lacking in detail, fails in several points to tally with our specimens. Unfortunately Joubin does not describe the funnel organ or figure the radula of his type, else it might not be necessary to leave to the future the final disposition of these forms.

Two very small specimens of the same genus [S.S.B. 439] were taken with the type, and I have small doubt that they are conspecific with it. Though neither has a total length of as much as two centimeters, they agree in most of the essential particulars. The larger of the two is probably a male.

5.—Moschites auroræ *new species.*

(Pl. XII., fig. 9; Pl. XIII., figs. 10, 11, 12.)

Description:

Body firm, about as long as broad; rounded and swollen at the sides but flattened above, compressed dorso-ventrally, and with a conspicuous longitudinal groove below. Pallial opening broad, extending fully halfway around the neck and terminating just below the posterior angle of the eyelid.

NATIONAL MUSEUM MELBOURNE

Head large, fairly well delimited, notably narrower than the body. Eyes large, prominently swollen.

Funnel stout, reaching just past the base of the arms, or about halfway between its posterior margin and the umbrella margin. Funnel organ well developed, almost quadripartite, well separated in the median line, so that each of the two resulting divisions has an outline like a V, with broad but sharply pointed limbs (text fig. 14).

Fig. 14.—*Moschites auroræ.*

Funnel organ of type. × 4.

Arms of nearly equal length, about twice as long as the body, the order quite regularly 4 = 3, 2, 1; extremities attenuate. Dorsal arms rounded; laterals with obsolete keels, except the third right arm in the male, which has a well developed seminal fold. Suckers (text figs. 15, 16) of moderate size and very closely placed (about 46 on the right second arm of the type); uniserial, but toward the base of the arms occasionally subject to lateral displacement so that they appear superficially biserial in this region on one arm (the right third) of the type, and almost triserial on another (the right ventral); cups deep. Third right arm hectocotylized. Umbrella well developed, of nearly equal extent all around, but best developed between the lateral arms and poorest between those of the ventral pair; extending along the arms for about a quarter to a third of their length.

Fig. 15.—*M. auroræ.*

Right dorsal arm suckers 6-11 of type. × 4.

Fig. 16.—*M. auroræ.*

Extremity of right third arm of type. × 8.

Hectocotylus very minute, both calamus and ligula bluntly conical, the latter with five or six fleshy but mostly rather obscure transverse grooves (text fig. 16).

Surface very closely and harshly papillose over the entire dorsal integument, the papillæ gradually diminishing in size and number laterally and absent from most of the ventral surface, though extending well down the umbrella and along the outer margins of the ventral arms. Individual papillæ small, mostly simple, bluntly conical in outline, and very distinct. There is a large, bluntly conical, papillose tubercle just above the posterior angle of the eyelid (text fig. 18), and a similar smaller one just above the anterior angle. A few scattered and very obscure tubercles larger than the ordinary papillæ occur elsewhere on the dorsum. A low, but very distinct subperipheral fold begins near the mantle margin and extends all around the body, forming a fairly accurate dividing line between the papillose and non-papillose areas.

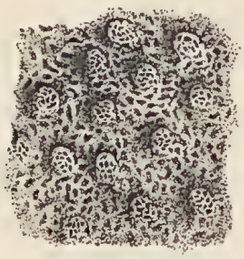


Fig. 17.—*M. auroræ.*

Region between eyes.

Fig. 18.—*M. auroræ.*

Region obliquely above left eye.

Color of body a dark slaty grey above, clouded with dim mottlings of a warmer tint, but becoming very pale ventrally and on the inner surfaces of the arms. Chromatophores exceedingly minute, very closely and evenly distributed above, but invisible over much of the light-colored areas.

Beak stout, mandibles black (text fig. 19).

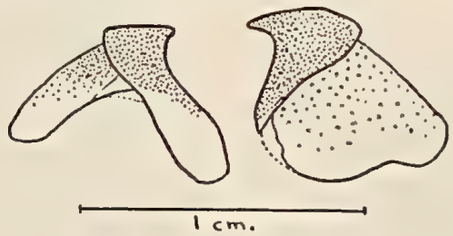


Fig. 19.—*M. auroræ.*

Mandibles.

Radula well developed, but transparent, and takes stain poorly (potassium bichromate). Rhachidian teeth helmet shaped, with acute points and distinct lateral cusps. First laterals weakly developed, very indistinct in outline. Second laterals with triangular teeth. Third laterals with long, curved, knife-shaped teeth. (Text fig. 20.)

Measurements :	Type. mm.	Juv. mm.
Total length	88	39
Tip of body to dorsal base of umbrella	36	15
Length of body	24	11
Width of body	25	13
Width of neck	19	10·5
Width across eyes	21	12
Length of funnel	13	5
Mouth to tip of right dorsal arm	50	29
Mouth to tip of left dorsal arm	49	23
Mouth to tip of right second arm	52	24
Mouth to tip of left second arm	51	22
Mouth to tip of right third arm	43	23
Mouth to tip of left third arm	54	22
Mouth to tip of right ventral arm	53	22
Mouth to tip of left ventral arm	55	21
Length of hectocotylus	2	—
Length of umbrella between dorsal arms	12	8
Length of umbrella between ventral arms	9	6

Type.—A male, Cat. No. C. 40891, of the Australian Museum [S.S.B. 437].

Type Locality.—Station VIII., Lat. South 66° 8′, Long. East 94° 17′ ; 120 fathoms, bottom of small granite rocks, January 27th, 1914 ; one ♂ specimen.

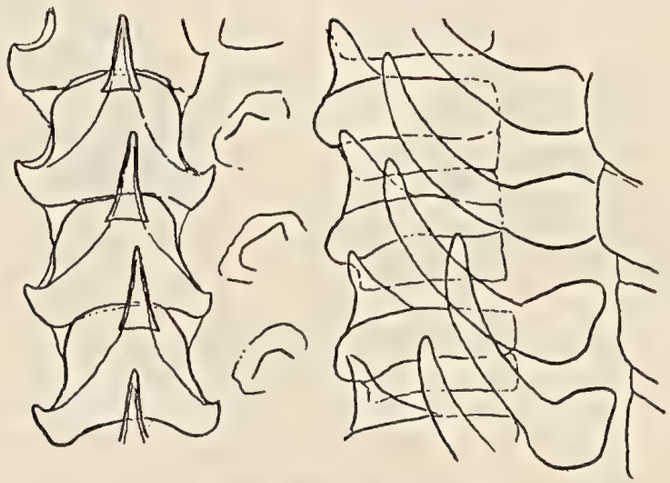


Fig. 20.—*M. auroræ.*

Radula.

Remarks.—Though represented in the collection by only one mature specimen, this characteristic little species has no close resemblance to any of the other forms taken by the Expedition. In the heavy papillation of the body, as well as the characters of the hectocotylus, it appears to resemble most nearly the *M. charcoti* (Joubin) from

the opposite side of the continent. The finer papillæ, their farther extent ventrally, the distinct peripheral fold, more slender arms, and paired cirri above the eyes, would seem, however, quite ample to distinguish it.

A single young specimen [S.S.B. 444] obtained at Station X., in 325 fathoms, is apparently referable to the same species, as it shares in the distinct papillation, peripheral fold, and other characters, while its proportionate dimensions are as nearly similar as could probably be expected.

6.—Moschites harrissoni *new species.*

(Pl. XIII., fig. 13 ; Pl. XIV., figs. 14, 15, 16.)

Description :

Body firm, plump, broader than long ; very rotund below, with a distinct longitudinal depression in the medio-ventral line. Pallial opening broad, terminating at a point below and a very little behind the posterior angle of the eye opening.

Head conspicuously narrower than the body, fairly well delimited by the slight nuchal constriction. Eyes large, prominent.

Funnel stout, conical, extending over half the distance from its posterior margin to the edge of the umbrella. Funnel organ conspicuous, comprising two broad-limbed U-shaped portions covering most of the inner wall (text fig. 21).

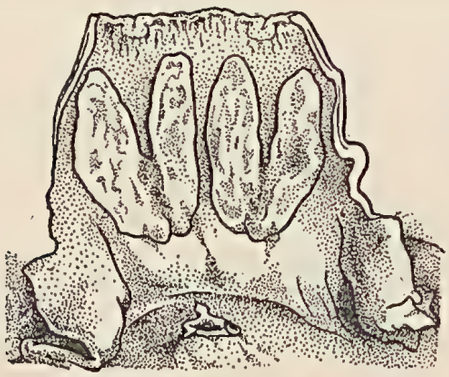


Fig. 21.—*Moschites harrissoni.*
Funnel organ of type. × 2.

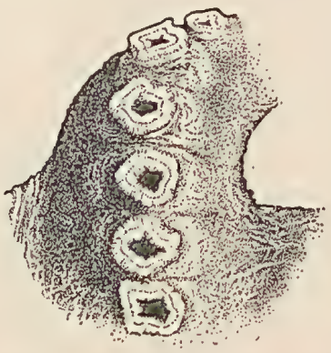


Fig. 22.—*Moschites harrissoni.*
Type. Suckers of right dorsal arm. × 2.

Arms stout, regularly tapering, and very short, scarcely twice as long as the head and body, or about two and a half times the length of the body alone ; without notable keels or webs ; dorsal arms shortest, the others very nearly of a length. Suckers (text fig. 22) quite large, deep cupped ; uniserial throughout, but sometimes more or less displaced by contraction ; about 44 on the right third arm. Umbrella short, nearly equal all around, but usually best developed at the sides, and a little longer between the ventral than the dorsal arms ; attached to the arms for about a quarter of their length.

Hectocotylus unknown.

Surface smooth except for numerous soft wrinkles due to the action of the preserving fluid, and a number of low conical papillæ scattered irregularly over the dorsum and sides, around the eye openings, and on the base of the four dorsal arms. A distinct subperipheral fold of integument begins some distance below the termination of the pallial aperture and encircles the body.

Color everywhere a dull clouded slaty grey, a trifle paler on the venter and the inner surfaces of the arms.

Beak black, powerful (text fig. 23).

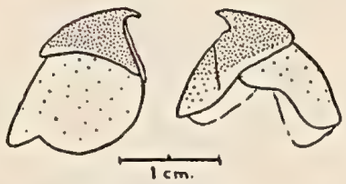


Fig. 23.—*Moschites harrissoni.*
Mandibles.

Radula well developed. Rhachidian teeth helmet shaped, with stout acute points, and bearing distinct lateral cusps at the base, intermediate cusps being present on certain teeth as well. First laterals small, obtusely pointed; second laterals with strong triangular teeth, springing from a rectangular base; third laterals with long, slightly curved, knife-like blades. (Text figs. 24, 25.)

	Type. #440	#441	#442	#443
Measurements:	mm.	mm.	mm.	mm.
Total length	190	208	140	26
Tip of body to dorsal base of umbrella	70	67	54	11
Length of body	51	50	39	8
Width of body	66	70	45	9
Width of neck	40	46	28	7
Width across eyes	45	48	39	8
Length of funnel	23	27	17	3
Mouth to tip of right dorsal arm	110	122	78	15
Mouth to tip of left dorsal arm	113	132	78	14·5
Mouth to tip of right second arm	128	133	83	15
Mouth to tip of left second arm	122	134	82	14
Mouth to tip of right third arm	121	126	87	14·5
Mouth to tip of left third arm	130	130	92	14·5
Mouth to tip of right ventral arm	130	137	89	15
Mouth to tip of left ventral arm	131	147	92	14·5
Length of umbrella between dorsal arms	21	33	21	3·5
Length of umbrella between ventral arms	27	35	21	3·5

Type.—A female, Cat. No. C. 40892, of the Australian Museum [S.S.B. 440].

Type Locality.—Station X., Lat. South 65° 6′, Long. East 96° 13′, off the Shackleton Ice-shelf, Queen Mary Land; 325 fathoms, ooze; bottom temp. −1·65 C.; January 29th, 1914; one ♀ specimen.

Material Examined:

No. Specimens.	Sex.	Depth.	Locality.	How Obtained.	Collector or Station.	Date.	Author's Register.	Remarks.
1	♀	Fms. 270	Off Shackleton Ice-shelf .	Trap	C. T. Harrisson ..	Jan., 1913...	[441]	—
1	♀	325	" " ..	Trawl	Station X.	Jan. 29, 1914	[440]	Type
1	♀	358	" " ..	"	Station XI.	Jan. 31, 1914	[442]	Paratype
1	—	358	" " ..	"	Station XI.	Jan. 31, 1914	[443]	—

Remarks.—This species is represented in the collection by more material than any of the others collected, a fortunate circumstance, since the specimens serve to verify many of the characters which have been held to be of taxonomic significance. Although the above description has been drawn practically in its entirety from the type, as the better preserved of the two largest specimens, both paratypes check up well with it, and on the whole give evidence of remarkably little variation.

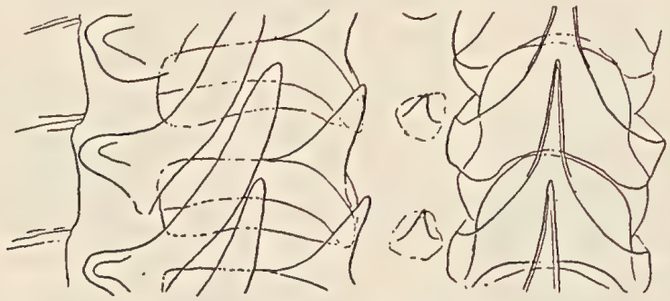


Fig. 24.—*M. harrissoni.*
Radula.

Owing to its similar color and consistency, and the short umbrella, *M. harrissoni* at first sight reminds one very much of the *M. adelieana* already described, but the duplex funnel organ (probably derived, however, from an organ shaped much like that of *M. adelieana*), obscurely papillose surface, conspicuous subperipheral fold, and notable differences in the radula are amply sufficient to distinguish them. The taxonomic value of the peripheral fold has been called in question by several writers, but, so far as my experience goes, its presence or absence in well preserved material is a matter of great constancy, and this is true of even very young specimens.

The juvenal taken at Station XI. agrees with the larger specimens in its short arms, short umbrella, and wide body, as well as the peripheral fold. The small papillæ,

however, are lacking. The surface is smooth and the color paler, besides showing a characteristic finely punctate condition due to the smaller number and greater distinctness of the chromatophores.

Fig. 25.—*Moschites harrissoni.*

Rhachidian teeth. × 55.

From the data given on three pencilled labels * accompanying the largest specimen I have no doubt that it is the one referred to in " The Home of the Blizzard " (Mawson :15, vol. 2, p. 127), the note being worthy of reproduction here—

> " Harrisson contrived a winch for sounding and fishing. Fourteen-gauge copper wire was wound on it and, through a crack in the sea-ice a quarter of a mile from the glacier, bottom was reached in 260 fathoms. As the water was too deep for dredging, Harrisson manufactured cage-traps and secured some fish, a squid, and other specimens."

This species appears to have been obtained only in the neighborhood of the Shackleton Ice-shelf, Queen Mary Land, though I cannot discover any good physiographical reason why it should not have turned up along with *M. albida* or *M. adelieana* farther to the eastward. Records to show the further distribution of all these forms will be awaited with interest.

The radula of *M. harrissoni* is much more like that of *M. auroræ* than any of the other species, the similarity being so very strong as perhaps to indicate close relationship. The divided funnel organ offers evidence in the same direction.

---

* The three labels read as follows :—
No. 1.—" Mollusca—Cephalopoda—*Order* Octopoda—Depth 270 (?) Fathoms—Trapped at 2d Base."
No. 2.—" From Western Base—Shackleton Glacier—Queen Mary Land—Coll. by C. Harrisson."
No. 3.—" Mollusca—Cephalopoda—*Order* Octopoda—Depth 270 fathoms—Captured at Second Base—C. T. H."

Suborder DECAPODA.

Division ŒGOPSIDA.

Family Brachioteuthidæ.

7.—Brachioteuthis *sp.*, *juv.* (?)

This [S.S.B. 446] and the following specimen were received from Mr. Charles Hedley, who found them among some other Expedition material bearing only the label "20 f., 21-1-14."* It is characterised by its short, flaring mantle (text fig. 26); very

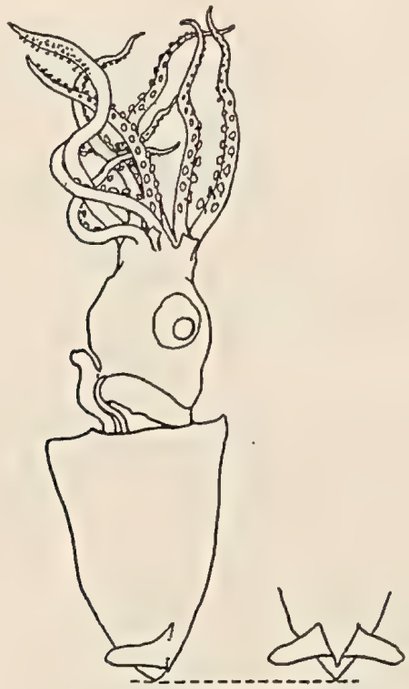


Fig. 26.—*Brachioteuthis.* (?)

× 6.

Fig. 27.

Sucker from left tentacle of 446.

minute, subterminal fins; double row of rather large urn-shaped suckers on the sessile arms; minute suckers (text fig. 27) on the tentacle club, scattered pairs of which continue down the stalk; conspicuous, but long and narrow locking cartilages without transverse grooves, on the base of the funnel, &c., &c. All the suckers are poised on rather long, slender pedicels. An umbrella is wanting. Maximum length, 13mm.; length of mantle alone, 5mm.

On the whole it seems probable that the specimen is referable to the genus *Brachioteuthis* (*Tracheloteuthis*), but, having no suitable material available for comparison, I feel no great certainty in the matter.

* At this date the "Aurora" was off Drygalski Island.—Ed.

INDETERMINABLE MATERIAL AND FRAGMENTS.

Larval Cephalopod.

A minute and much dilapidated cephalopod [S.S.B. 445] was obtained in 20 fathoms with the preceding specimen, January 21st, 1914. The specimen has a total length of only about 8mm., and is not in condition for description or determination.

[S.S.B. 449.]

Fragments of half-digested *Moschites* and four loose cephalopod mandibles were taken from the stomach of a Weddell seal shot at Adelie Land, Lat. South 67°, November 3rd, 1912. With our present scanty knowledge, any attempt at specific determination would be premature. The radula of the *Moschites* somewhat resembles that of *M. adelieana*, but does not coincide with the latter in all particulars.

[S.S.B. 450.]

This lot comprises about 90 loose mandibles, apparently belonging to several genera of cephalopods, taken from the stomach of a large sea elephant (*Macrorhinus leoninus*), at Macquarie Island (*vide* Mawson, :15, vol. 2, pp. 200, 220). Three of the mandibles are here figured (text figs. 28-30).

Fig. 28.—*Cephalopod.*
Mandible.

Fig. 29.—*Cephalopod.*
Mandible.

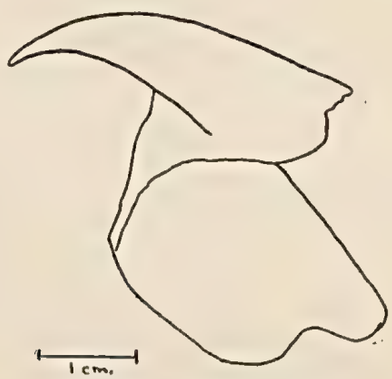


Fig. 30.—*Cephalopod.*
Mandible.

[S.S.B. 451.]

Remains of two medium sized cephalopoda, consisting in each instance of merely the arms and buccal portion, were taken from the ejecta of penguins at Macquarie Island. Although in wretched condition from the effects of the digestive fluids, enough is left to show that both specimens are the same species and represent some decapod, perhaps an Ommastrephid, with two rows of arm suckers.

LIST OF STATIONS AT WHICH CEPHALOPODS WERE TAKEN.

Off Maria Island, Tasmania; 65 fathoms; December 12th, 1912.

1 ♀ *Polypus duplex* (Hoyle) ?

From stomach of Weddell seal, Adelie Land, Lat. South 67°; November 3rd, 1912.

1 *Moschites* sp. (fragments).

4 mandibles.

From stomach of *Macrorhinus*, Macquarie Island.

90 mandibles.

From ejecta of penguins, Macquarie Island.

2 œgopsids (fragments).

Off Shackleton Ice-shelf, Queen Mary Land; 270 (?) fathoms; cage trap; C. T. Harrisson, January, 1913.

1 ♀ *Moschites harrissoni* n. sp.

STATION II.

Lat. South 66° 55′, Long. East 145° 21′, off the Mertz Glacier Tongue, Adelie Land; 288-300 fathoms, ooze; bottom temp. −1·8° C.; large trawl (Agassiz type); December 28th, 1913.

1 *Stauroteuthis mawsoni* n. sp.

1 ♀, 2 juv. *Moschites adelieana* n. sp.

STATION V.

Lat. South 64° 34′, Long. East 127° 17′; 1,700 fathoms, bottom of thick ooze and rocks; bottom temp. −0·3° C.; large trawl (Agassiz type); January 6th, 1914.

1 ♀ *Moschites albida* n. sp.

Station VIII.

Lat. South 66° 8′, Long. East 94° 17′; 120 fathoms, bottom of few small granite rocks with abundant life; small dredge (Ball type); January 27th, 1914.

1 ♂ *Moschites auroræ* n. sp.

Station X.

Lat. South 65° 6′, Long. East 96° 13′, off Shackleton Ice-shelf; 325 fathoms, ooze; bottom temp. −1·65° C.; large trawl (Agassiz type); January 29th, 1914.

1 juv. *Moschites auroræ* n. sp.

1 ♀ *Moschites harrissoni* n. sp.

Twenty fathoms; January 21st, 1914.

1 larval *Brachioteuthis* (?)

1 larval cephalopod.

Station XI.

Lat. South 64° 44′, Long. East 97° 28′, off Shackleton Ice-shelf; 358 fathoms, ooze; large trawl (Agassiz type); January 31st, 1914.

1 ♂, 1 juv. *Moschites harrissoni* n. sp.

BIBLIOGRAPHY.

Chun, Carl.

:10. Die Cephalopoden. I. Teil: Oegopsida. Wissenschaftliche Ergebnisse der deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia" 1898-1899, Bd. 18, p. 1-402, 2 pl. and 32 fig. in text, and atlas of 61 pl., Jena, 1910.

:15. Die Cephalopoden. II. Teil: Myopsida, Octopoda. Wissenschaftliche Ergebnisse der deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia" 1898-1899, Bd. 18, p. 403-552 [1-150], text fig. 33-71, pl. 62-95, Jena, 1915. (The title page of the volume gives the date as 1914, but the publisher's board covers for this portion of the work are dated 1915.)

Hoyle, William E.

:85. Diagnoses of new species of Cephalopoda collected during the cruise of H.M.S. "Challenger."—Part I. The Octopoda. Annals and Magazine of Natural History (5), vol. 15, p. 222-236, March 1885.

:85a. Diagnoses of new species of Cephalopoda collected during the cruise of H.M.S. "Challenger."—Part II. The Decapoda. Annals and Magazine of Natural History (5), vol. 16, p. 181-203, September 1885.

:86. Report on the Cephalopoda collected by H.M.S. "Challenger" during the year 1873-76. Voyage of the "Challenger," vol. 16, part 44, p. i.-vi., 1-246, 9 fig. in text, map, pl. 1-33, 1886.

:07. Mollusca.—I. Cephalopoda. British National Antarctic Expedition, Natural History Reports, vol. 2, 2 p., 1 fig. in text, London, 1907.

:12. The Cephalopoda of the Scottish National Antarctic Expedition. Transactions Royal Society of Edinburgh, vol. 48, part 2, p. 273-283, 9 fig. in text, May 1912.

Joubin, Louis.

:03. Céphalopodes. Résultats du Voyage du S.Y. "Belgica" en 1897-1898-1899, sous le commandement de A. de Gerlache de Gomery, Zoologie, 2 p., Antwerp 1903.

:05. Description de deux Eledones provenant de l'Expedition du Dr. Charcot dans l'Antarctique. Mémoires Société Zoologique Française, t. 18, p. 22-31, text fig. 1-3, pl. 3, 1905.

:06. Céphalopodes. Expédition antarctique française (1903-1905), commandée par le Dr. Jean Charcot, Documents Scientifiques, 12 p., text fig. 1-3, pl. 1, Paris 1906.

Mawson, Sir Douglas.

:15. "The Home of the Blizzard," being the story of the Australasian Antarctic Expedition, 1911-1914; 2 vol., large 8vo., with numerous illustrations and maps; London and Philadelphia, 1915.

Thompson, D'Arcy W.

'98. On a supposed resemblance between the marine faunas of the Arctic and Antarctic regions. Proceedings Royal Society, Edinburgh, Sess. 1897-98, p. 311-349, 1898.

EXPLANATION OF PLATES.

(Author's Note.—*All of the plated figures are from photographs prepared by Mr. E. F. Everitt and Mr. E. Russell Lord-Wood.*)

Plate X.

Fig. 1.—*Stauroteuthis mawsoni* n. sp., dorsal view of type specimen [S.S.B. 447], enlarged about one-third.

Fig. 2.—*Moschites albida* n. sp., dorsal view of type specimen [S.S.B. 436], natural size.

Fig. 3.—*Moschites albida* n. sp., ventral view of type specimen [S.S.B. 436] natural size.

Plate XI.

Fig. 4.—*Moschites albida* n. sp., oral view of type specimen [S.S.B. 436], somewhat reduced.

Fig. 5.—*Moschites adelieana* n. sp., dorsal view of type specimen [S.S.B. 438], natural size.

Plate XII.

Fig. 6.—*Moschites adelieana* n. sp., ventral and oral view of type specimen [S.S.B. 438], natural size.

Fig. 7.—*Moschites adelieana* n. sp., lateral view of type specimen [S.S.B. 438], natural size.

Fig. 8.—*Moschites adelieana* n. sp., dorsal view of juvenal [S.S.B. 439], enlarged about two diameters.

Fig. 9.—*Moschites auroræ* n. sp., dorsal view of type specimen [S.S.B. 437], enlarged about one-fifth.

Plate XIII.

Fig. 10.—*Moschites auroræ* n. sp., ventral view of type specimen [S.S.B. 437], enlarged about one-fifth.

Fig. 11.—*Moschites auroræ* n. sp., lateral view of type specimen [S.S.B. 437], enlarged about one-fifth.

Fig. 12.—*Moschites auroræ* n. sp., dorsal view of juvenal [S.S.B. 444], enlarged about one-half.

Fig. 13.—*Moschites harrissoni* n. sp., dorsal view of paratype [S.S.B. 442], somewhat reduced.

Plate XIV.

Fig. 14.—*Moschites harrissoni* n. sp., lateral view of paratype [S.S.B. 442], somewhat reduced.

Fig. 15.—*Moschites harrissoni* n. sp., oral view of type specimen [S.S.B. 440], considerably reduced.

Fig. 16.—*Moschites harrissoni* n. sp., lateral view of juvenal [S.S.B. 443], enlarged about one-half.

EXPLANATION OF TEXT FIGURES.

Fig. 1.—*Stauroteuthis mawsoni*, ventral view of type specimen [S.S.B. 447], × 3.

Fig. 2.—*Stauroteuthis mawsoni*, lateral view of type specimen [S.S.B. 447], × 3.

Fig. 3.—*Stauroteuthis mawsoni*, oral aspect of left dorsal arm [S.S.B. 447], × 7.

Fig. 4.—*Stauroteuthis mawsoni*, eleventh sucker from base, with accompanying papillæ, from right dorsal arm of type [S.S.B. 447], × 36.

Fig. 5.—*Polypus* (*duplex* Hoyle ?), camera outline of a portion of the radula [S.S.B. 448], × —.

Fig. 6.—*Moschites albida*, funnel of type specimen, laid open along the medio-ventral line to show the funnel organ [S.S.B. 436], × 2.

Fig. 7.—*Moschites albida*, the ninth to fourteenth suckers of the right dorsal arm of the type specimen [S.S.B. 436], × 3.

Fig. 8.—*Moschites albida*, camera sketch of the mandibles [S.S.B. 436], × 3.

Fig. 9.—*Moschites albida*, camera outline of a portion of the radula [S.S.B. 436], × —.

Fig. 10.—*Moschites adelieana*, funnel of type specimen, laid open along the medio-ventral line to show the funnel organ [S.S.B. 438], × 3.

Fig. 11.—*Moschites adelieana*, the seventh to tenth suckers of the right dorsal arm of the type specimen [S.S.B. 438], × 3.

Fig. 12.—*Moschites adelieana*, camera sketch of mandibles [S.S.B. 438].

Fig. 13.—*Moschites adelieana*, camera outline of a portion of the radula [S.S.B. 438], × —.

Fig. 14.—*Moschites auroræ*, funnel of type specimen, laid open along the medio-ventral line to show the funnel organ [S.S.B. 437], × 4.

Fig. 15.—*Moschites auroræ*, the sixth to eleventh suckers of the right dorsal arm of the type specimen [S.S.B. 437], × 4.

Fig. 16.—*Moschites auroræ*, extremity of right third arm of type [S.S.B. 437], showing hectocotylus, × 8.

Fig. 17.—*Moschites auroræ*, integumentary papillæ from region between the eyes [S.S.B. 437], × $13\frac{1}{2}$.

Fig. 18.—*Moschites auroræ*, integumentary papillæ from region obliquely above left eye [S.S.B. 437], × $13\frac{1}{2}$.

Fig. 19.—*Moschites auroræ*, camera sketch of mandibles [S.S.B. 437].

Fig. 20.—*Moschites auroræ*, camera outline of a portion of the radula [S.S.B. 437], × —.

Fig. 21.—*Moschites harrissoni*, funnel of type specimen [S.S.B. 440], laid open along the medio-ventral line to show the funnel organ, × 2.

Fig. 22.—*Moschites harrissoni*, the fourth to ninth suckers of the right dorsal arm of the type [S.S.B. 440], × 2.

Fig. 23.—*Moschites harrissoni*, camera sketch of mandibles [S.S.B. 441].

Fig. 24.—*Moschites harrissoni*, camera outline of a portion of the radula of the type specimen [S.S.B. 440], × —.

Fig. 25.—*Moschites harrissoni*, camera outline of lateral view of rhachidian teeth from radula of another specimen [S.S.B. 441], × —.

Fig. 26.—*Brachioteuthis* ? larva, oblique lateral view [S.S.B. 446], much enlarged.

Fig. 27.—*Brachioteuthis* ? larva, camera outline of sucker from left tentacle club, from mount in balsam [S.S.B. 446], × —.

Figs. 28, 29, 30.—Camera sketches of cephalopod mandibles of unknown identity [S.S.B. 450].

INDEX.

PAGE.

adelieana Moschites 7, 10, 13, 14, 17, 18, 19, 20, 26, 27, 29, 31, 35, 37
albida Moschites 7, 13, 14, 15, 16, 17, 27, 31, 35, 37
auroræ Moschites 7, 13, 14, 20, 21, 22, 23, 27, 32, 35, 37, 38

Brachioteuthis 28, 32, 38

cephalopod (text fig.) 29
charcoti Moschites 14, 23

duplex Octopus 12
duplex Polypus 11, 31, 37

harrissoni Moschites 7, 13, 14, 24, 25, 26, 27, 31, 32, 36, 38

leoninus Macrorhinus 29, 31

Macrorhinus leoninus 29, 31
mawsoni Moschites 7
mawsoni Stauroteuthis 7, 8, 31, 35, 37
meangensis Stauroteuthis 10
Moschites 7, 14, 17, 29, 31
Moschites adelicana 7, 10, 13, 14, 17, 18, 19, 20, 26, 27, 29, 31, 35, 37
Moschites albida 7, 13, 14, 15, 16, 17, 27, 31, 35, 37
Moschites auroræ 7, 13, 14, 20, 21, 22, 23, 27, 32, 35, 37, 38
Moschites charcoti 14, 23
Moschites harrissoni 7, 13, 14, 24, 25, 26, 27, 31, 32, 36, 38
Moschites mawsoni 7
Moschites rotunda 14, 17
Moschites turqueti 14, 17, 20

Octopus duplex 12
Polypus 7, 13
Polypus duplex 11, 31, 37

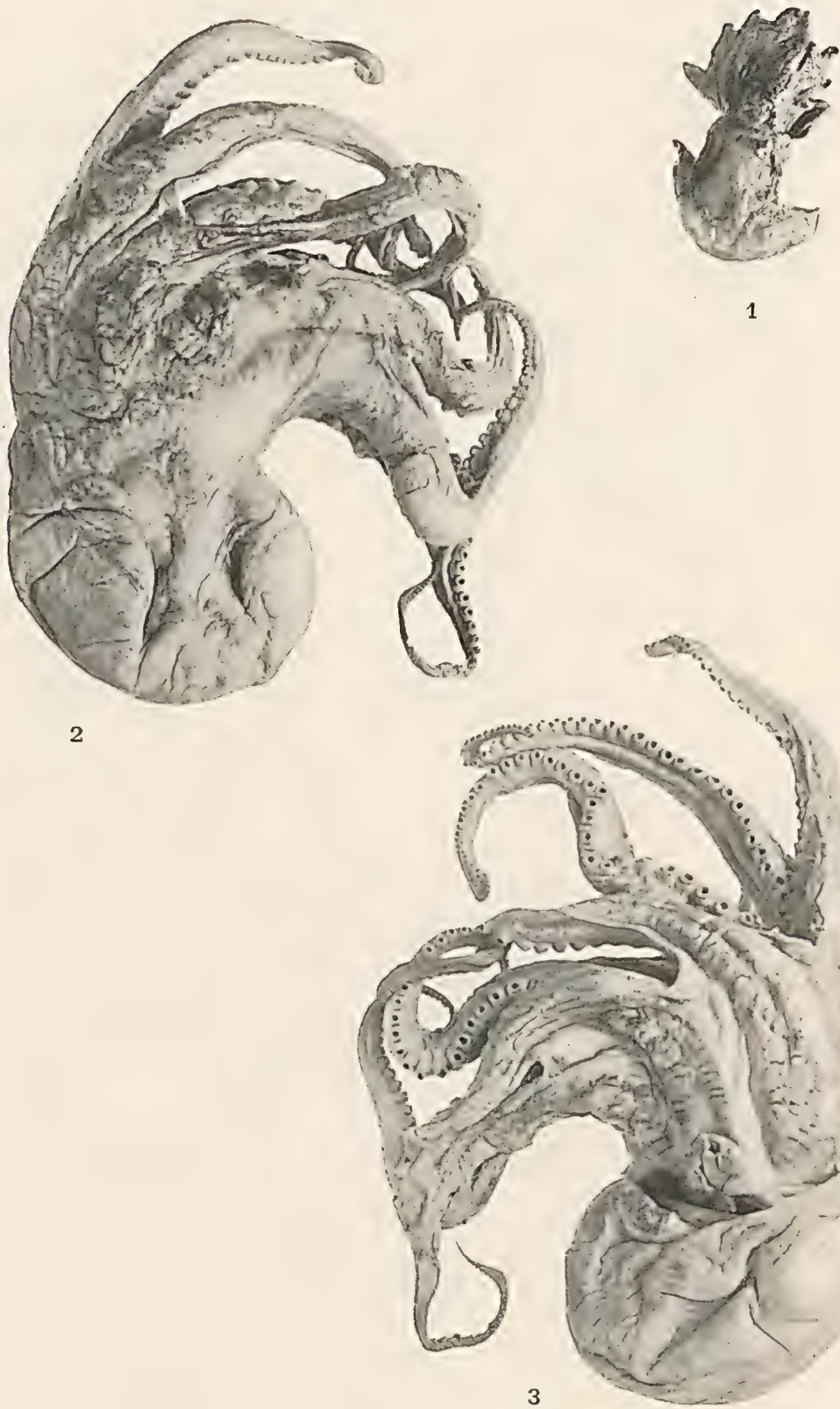
rotunda Moschites 14, 17

Stauroteuthis 11
Stauroteuthis mawsoni 7, 8, 31, 35, 37
Stauroteuthis meangensis 10

Tracheloteuthis 28
turqueti Moschites 14, 17, 20

PLATES

CEPHALOPODA.—BERRY.



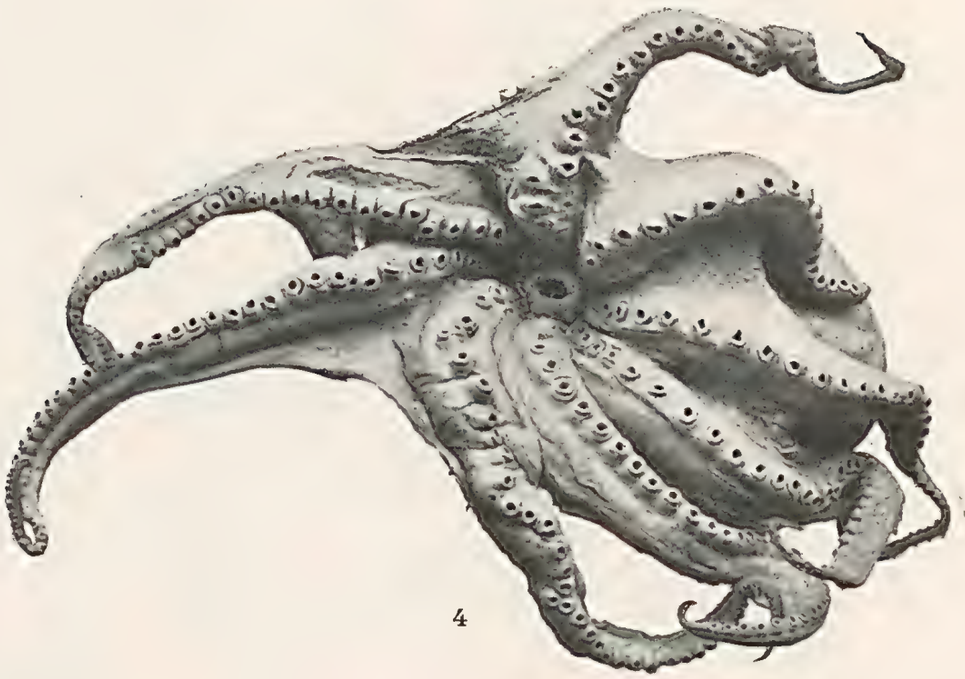
1

2

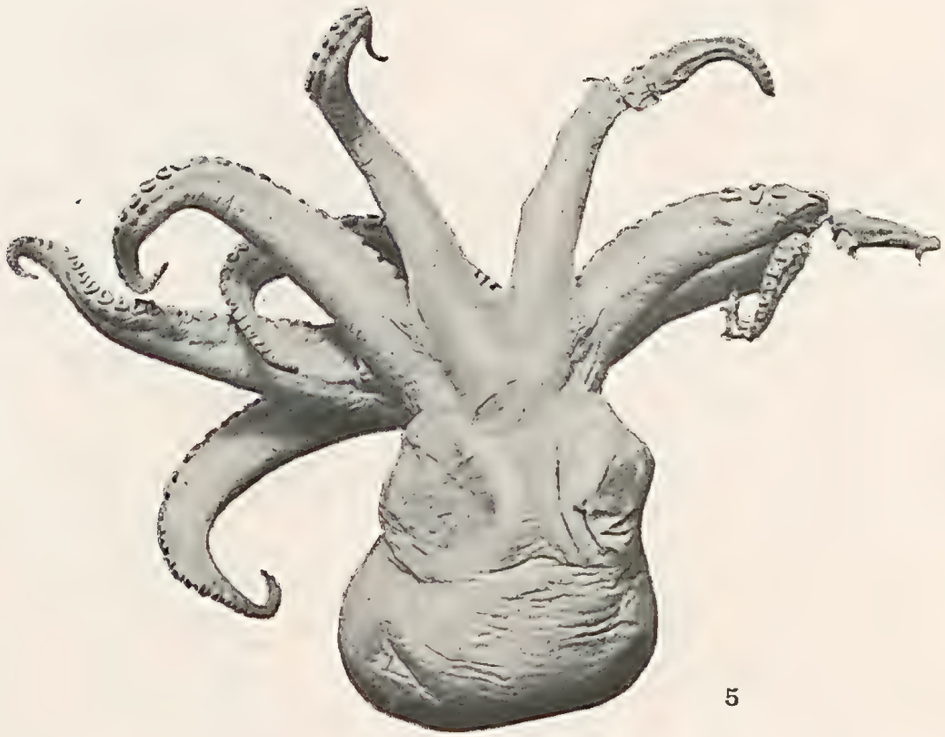
3

NATIONAL MUSEUM MELBOURNE

CEPHALOPODA.—BERRY.



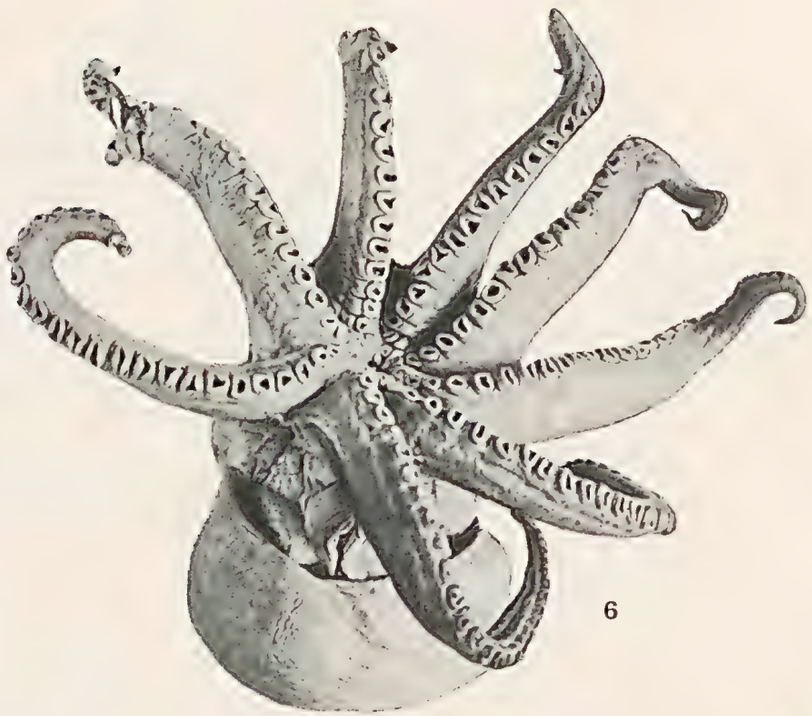
4



5

NATIONAL MUSEUM MELBOURNE

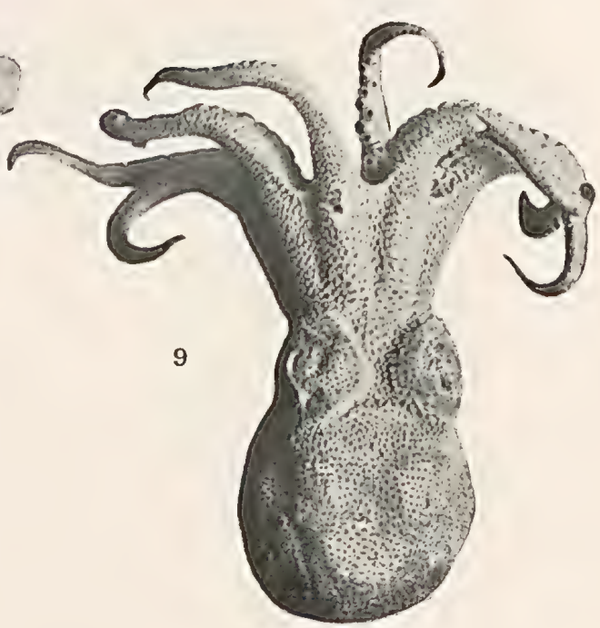
CEPHALOPODA.—BERRY.



6

8

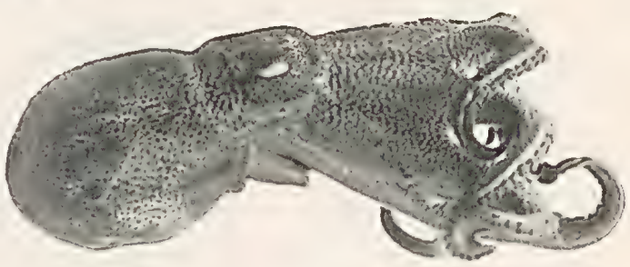
7



9

CEPHALOPODA.—BERRY.

10

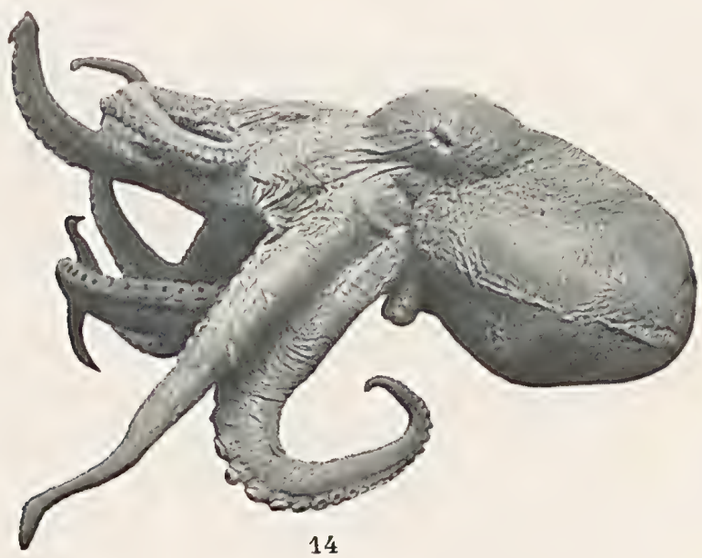


11

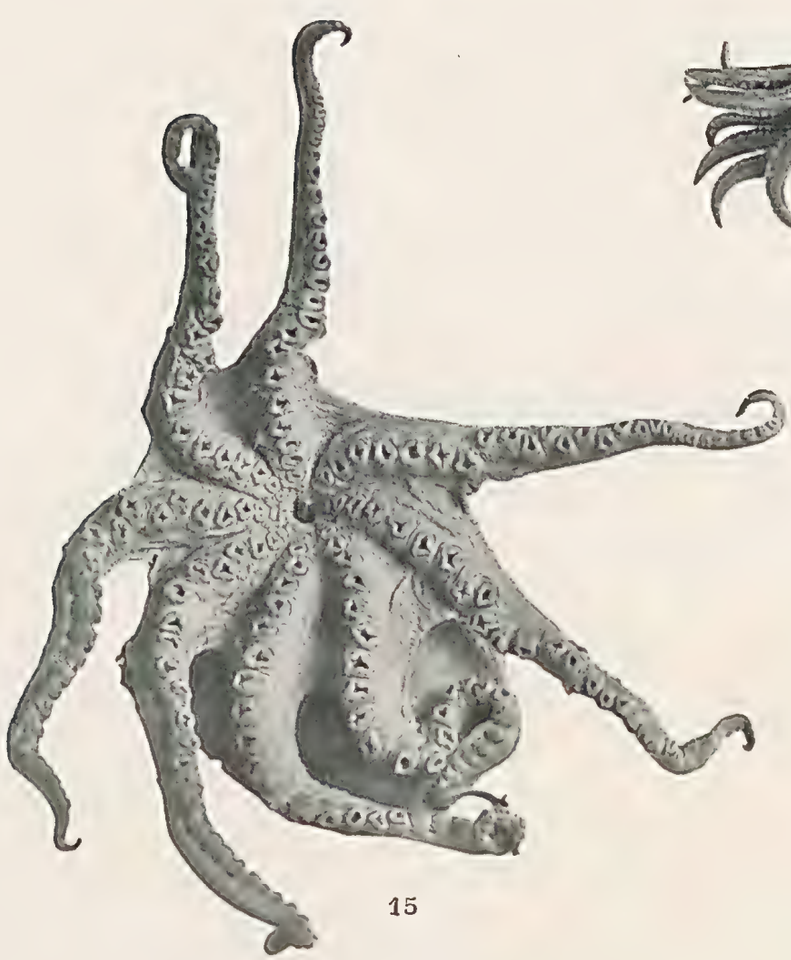
12

13

CEPHALOPODA.—BERRY.



14



15

16

Series C.—REPORTS IN COURSE OF PREPARATION.

ZOOLOGY.

FORAMINIFERA	Mr. F. Chapman, A.L.S., F.R.M.S., National Museum, Melbourne.
MONAXONID SPONGES AND TETRAXONID SPONGES	Mr. E. F. Hallmann, B.Sc., University, Sydney.
HEXACTINELLID SPONGES	Prof. I. Ijima, College of Science, Tokyo, Japan.
CALCAREOUS SPONGES	Prof. A. S. Dendy, F.R.S., D.Sc., F.Z.S., King's College, London.
HYDROZOA	Mr. E. A. Briggs, B.Sc., Australian Museum, Sydney.
ACTINOZOA	Prof. J. Arthur Thomson, F.R.S., University, Aberdeen.
TREMATODES	Dr. S. J. Johnston, University, Sydney.
CESTODES	Dr. T. Harvey Johnston, University, Brisbane.
NEMATODES (FREE)	Dr. N. A. Cobb, Bureau of Plant Industry, Washington, U.S.A.
CHÆTOGNATHA AND ACANTHOCEPHALA	Dr. T. Harvey Johnston, University, Brisbane.
ROTIFERA AND TARDIGRADA	Mr. J. Shephard, Melbourne.
ECHINOIDEA	Prof. R. Koehler, Université, Lyon, France.
ASTEROIDEA AND OPHIUROIDEA	Prof. R. Koehler, Université, Lyon, France.
CRINOIDEA AND HOLOTHUROIDEA	Prof. M. Vaney, Université, Lyon, France.
ANNULATA (EXCEPT LEECHES)	Prof. W. B. Benham, M.A., D.Sc., F.R.S., University of Otago, Dunedin, New Zealand.
LEECHES	Chas. Badham, B.Sc., University of Sydney.
CRUSTACEA COPEPODA AND OSTRACODA	Dr. G. S. Brady, F.R.S., Sheffield, England.
CRUSTACEA CUMACEA	Dr. W. T. Calman, British Museum, London.
CRUSTACEA SCHIZOPODA	Dr. W. M. Tattersall, University Museum, Manchester, England.
CRUSTACEA AMPHIPODA AND C. ISOPODA	Prof. C. Chilton, M.A., D.Sc., F.L.S., Canterbury College, Christchurch, New Zealand.
CRUSTACEA MACRURA AND C. CIRRIPEDA	Miss F. Bage, M.Sc., F.L.S., University, Brisbane.
CRUSTACEA BRACHYURA	Miss M. J. Rathbun, United States National Museum, Washington, U.S.A.
MALLOPHAGA	Dr. T. Harvey Johnston, University, Brisbane, and Mr. L. Harrison, B.Sc., Sydney.
SPIDERS	Mr. W. J. Rainbow, F.E.S., F.L.S., Australian Museum, Sydney.
TICKS	Mr. L. Harrison, B.Sc., Sydney.
PYCNOGONIDA	Prof. T. T. Flynn, B.Sc., University of Tasmania, Hobart.
*MOLLUSCA CEPHALOPODA	Dr. S. S. Berry, Redlands, California, U.S.A.
BRACHIOPODA	Dr. J. A. Thomson, Dominion Museum, Wellington, N.Z.
TUNICATES	Prof. W. A. Herdman, F.R.S., University, Liverpool, England.
CEPHALODISCUS	Mr. R. Ridewood, B.Sc., British Museum.
BIRDS	Mr. H. Hamilton, Dominion Museum, Wellington, N.Z., and Mr. R. Basset Hull, Sydney.
MAMMALS	Mr. H. Hamilton, Dominion Museum, Wellington, N.Z.

BOTANY.

MOSSES	Rev. W. W. Watts, Sydney.
PHYTOPLANKTON AND FRESH-WATER ALGÆ	Prof. F. E. Fritsch, University of London.
LICHENS AND FUNGI	Mr. E. Cheel, Botanic Gardens, Sydney.
MARINE ALGÆ	Mr. A. H. S. Lucas, M.A., B.Sc., Grammar School, Sydney.
VASCULAR PLANTS	Mr. T. F. Cheeseman, F.L.S., F.Z.S., Auckland Museum, N.Z.

* Issued.

NATIONAL MUSEUM WELLINGTON

AUSTRALASIAN ANTARCTIC EXPEDITION

1911–14.

UNDER THE LEADERSHIP OF SIR DOUGLAS MAWSON, D.Sc., B.E.

SCIENTIFIC REPORTS.

SERIES C.—ZOOLOGY AND BOTANY.

VOL. IV. PART 3.

BRACHIOPODA

BY

J. ALLAN THOMSON, M.A., D.Sc.,

DIRECTOR DOMINION MUSEUM, WELLINGTON, NEW ZEALAND.

WITH FOUR PLATES AND ONE MAP.

PRICE: SIX SHILLINGS.

TO SUBSCRIBERS: FIVE SHILLINGS.

Printed by William Applegate Gullick, Government Printer, Phillip-street, Sydney.—1918.

ISSUED 1ST JUNE, 1918.

Series C.—REPORTS ALREADY ISSUED.

Vol.	Part.		Price. s.	d.
III.	1.	FISHES. By Mr. Edgar R. Waite, F.L.S., South Australian Museum, Adelaide	8	6
III.	2.	PTEROBRANCHIA. By Dr. W. G. Ridewood, D.Sc., British Museum (Natural History) ...	2	6
IV.	1.	MOLLUSCA;—PELECYPODA AND GASTROPODA. By Mr. C. Hedley, F.L.S., Australian Museum, Sydney	3	6
IV.	2.	MOLLUSCA;—CEPHALOPODA. By Dr. S. S. Berry. Redlands, California, U.S.A.	8	6
V.	1.	ARACHNIDA FROM MACQUARIE ISLAND. By Mr. W. J. Rainbow, F.E.S., Australian Museum, Sydney	1	0
V.	2.	BRACHYURA. By Miss Mary J. Rathbun, U.S. National Museum, Washington	1	0
V.	3.	COPEPODA. By Dr. G. Stewardson Brady, F.R.S.	5	6
V.	4.	CLADOCERA AND HALOCYPRIDÆ. By Dr. G. Stewardson Brady, F.R.S.	2	0
V.	5.	EUPHAUSIACEA AND MYSIDACEA. By Dr. W. M. Tattersall, D. Sc., Keeper, University Museum, Manchester	1	6

NATIONAL MUSEUM MELBOURNE

AUSTRALASIAN ANTARCTIC EXPEDITION
1911–14.
UNDER THE LEADERSHIP OF SIR DOUGLAS MAWSON, D.Sc., B.E.

SCIENTIFIC REPORTS.
SERIES C.—ZOOLOGY AND BOTANY.
VOL. IV. PART 3.

BRACHIOPODA

BY
J. ALLAN THOMSON, M.A., D.Sc.,
DIRECTOR DOMINION MUSEUM, WELLINGTON, NEW ZEALAND.

WITH FOUR PLATES AND ONE MAP.

PRICE: SIX SHILLINGS.
TO SUBSCRIBERS: FIVE SHILLINGS.

Printed by William Applegate Gullick, Government Printer, Phillip-street, Sydney.—1918.

CONTENTS.

	PAGE.
Introduction and Acknowledgments	5
Part I—Systematic Description	6
Part II—Geographical Distribution of the Brachiopoda in the Southern Seas	37
List of Papers consulted	62
Explanation of Plates	68
Index	71

Plates and Map.

BRACHIOPODA.

By J. Allan Thomson, M.A., D.Sc., F.G.S., Director, Dominion Museum, Wellington, New Zealand.

INTRODUCTION AND ACKNOWLEDGMENTS.

The Brachiopoda of the Australian Antarctic Expedition, 1911–1914, are not many in number, but are relatively rich in species, and add considerably to a knowledge of the faunas of the Antarctic coast-line, Macquarie Island, and Tasmania.

In the description by Eichler (1911) of the Brachiopods obtained by the German Antarctic Expedition, 1901–1903, a resumé of the known Antarctic fauna has been given. It is now a quarter of a century since an account of the distribution of the class in the southern hemisphere was given by Fischer and Oehlert (1892), and since that time a considerable number of new species have been described and many previous identifications have been corrected. Much also has been learnt with respect to the southern Tertiary faunas, from which these recent faunas have in great part descended. The present seems a fitting opportunity to bring together these new facts, and to show their bearing on the theories of southern land connections which it is one of the aims of Antarctic expeditions to prove or disprove. The first part of this report, therefore, will be devoted to a systematic description and comparison of the new material, and the second to an account of the geographical distribution of the Brachiopoda in the south temperate and Antarctic seas. To render the latter more complete, descriptions of two new and significant species from New Zealand have been included.

My warmest thanks are due to Mr. C. Hedley, of Sydney, for generously assenting to the present arrangement for the description of these specimens after they had been already allocated to him, and also for his kindly encouragement and assistance. Professor H. B. Kirk, of Victoria College, Wellington, has given freely of his time in overcoming difficulties in the study of the spicules and of the shell structure. The photographs from which the plates were prepared were taken mainly by myself, but I have to thank Messrs. J. McDonald and F. E. Tomlinson of the Dominion Museum, Wellington, for much assistance in this branch of the work, and especially in the preparation of the prints from the negatives. Mr. G. E. Harris, draughtsman to the Geological Survey of New Zealand, kindly undertook the lettering of the accompanying map.

PART I.

Systematic Description.

PRELIMINARY REMARKS ON SPICULES AND SHELL STRUCTURE.

Before discussing the species in detail, it is desirable to give an account of the calcareous spicules contained in the soft parts of certain brachiopods, since no good presentation of the existing state of knowledge as to these bodies has yet appeared in any English publication.

The spicules generally consist of nearly flat plates of calcite, and each one is composed of a single crystal of the mineral, so oriented that the plane of flattening is parallel to the basal plane (111). The plates therefore give good uniaxial interference figures in convergent polarised light. They are frequently perforated by a number of holes, which I have termed "windows," and generally give off a number of angular lateral processes, so that some are almost stellate in form. The upper and lower surfaces of the plates are not infrequently adorned with numerous small spines. In other cases the spicules form linear, rod-like bodies, of less regular crystallographic orientiation.

In such species as bear them the spicules may be found in the body walls, the mantles or only the sinuses thereof, around the mouth, in the walls of the arms and in the cirri of the arms. They lie, according to van Bemmelen (1882) below the epithelium in the connective tissue, and are surrounded each by a membrane, of which they are the product. The genera in which they are known are *Thecidea*, *Liothyrina*, *Liothyrella*, *Terebratulina*, *Chlidonophora*, *Eucalathis*, *Dyscolia*, *Argyrotheca*,* *Platidia*, *Kraussina*, *Megerlina*, *Mühlfeldtia* and *Laqueus*.

The functions of the spicules are not yet well known. Occasionally adjacent spicules are united by their lateral process, and they may thus serve to act as an internal skeleton and strengthen the parts of the animal in which they lie. Deslongchamps (1884, p. 206) states that in *Kraussina rubra* the mantle is furnished with very small and thin spicules which serve to protect the circulatory organs, there being one system for the venous sinuses and another of different shape for the arterial organs. It may be supposed that in the short looped forms (*Terebratulidæ*) the presence of spicules in the free arms tends to give rigidity to these organs, which are unsupported by a calcareous loop.† The spicules are, however, relatively much more massive in the arms of the smaller species than in those of the larger, and if they performed a useful function of such a nature, it is difficult to see why they should not be found better developed in the larger species.

Deslongchamps (1860, 1865, and 1884) was the first to make a study of brachiopod spicules and to employ them in classification. In 1884 he divided the Terebratulidae into two groups, the first, which included *Liothyris* (now *Liothyrina*),

* Blochmann does not recognise this genus as possessing spicules, but Dall (1871, p. 24) mentions that a few were observed in the pallial sinuses of *Cistella lutea*=*Argyrotheca*.

† Twelvetrees and Petterd (1900) consider that this is the function of the spicules of *Megerlina lamarckiana*.

Terebratulina, *Disculina*, *Megerlia*, (now *Mühlfeldtia*), *Megerlina*, *Kraussina*, and *Platidia*, being characterised by the absence of profound metamorphoses in the development of the loop and by the presence of spicules, the second group which included *Terebratula*, *Macandrevia*, *Waldheimia*, *Neothyris*, *Terebratella*, &c., being characterised by the presence of profound metamorphoses in the development of the loop and by the absence of spicules. This classification has not been sustained, being replaced by that of Beecher (1895) in which the family and sub-family characters are drawn from considerations of loop development only, based on a much more extensive knowledge of the latter than Deslongchamps possessed. It is worthy of enquiry whether the presence or absence of spicules cannot be brought into line with Beecher's classification.

The spicules are not preserved in fossil forms, and it was quite an arbitrary assumption on Deslongchamps' part that *Terebratula* possessed no spicules. All the recent genera of the *Terebratulidae* (as now restricted) of which the bodies are known are possessed of spicules, viz., *Liothyrina*, *Liothyrella*, *Terebratulina*, *Chlidonophora*, *Eucalathis* and *Dyscolia*, the only genus of which the body is unknown being *Murravia*, (Thomson, 1916, No. 1). It may therefore be assumed with some degree of assurance that spicules were also present in *Terebratula* and the other extinct genera of the family and that the presence of spicules is a constant character of the *Terebratulidae*.

The genera of the *Terebratellidae* which are known to possess spicules are distributed at present in the sub-families as follows :—

Dallininae : Platidia, *Laqueus*.
Magellaninae : Kraussina, *Megerlina*, and *Mühlfeldtia*.
Megathyrinae : Argyrotheca (some species only).

I have recently (1916, No. 2) given reasons for doubting whether *Kraussina*, *Megerlina* and *Mühlfeldtia* are correctly placed within the *Magellaninae*, and suggested that they may prove to form a separate sub-family, which may also include *Aldingia*, *Kingena* and *Laqueus*. The bodies of *Aldingia* and *Kingena* are not yet known, but the remainder of these genera all possess spicules, and if their separation into a sub-family is sustained by a further study of the loop development of the higher forms, the presence of spicules in the *Terebratellidae* will then be confined to this sub-family alone, so far as present knowledge goes, with the exceptions only of *Argyrotheca* and *Platidia*. As will be seen below,* there are other grounds for doubting whether *Platidia* belongs to the *Dallininae*, and it is suggested that it belongs to still another sub-family.

Besides Deslongchamps, Fischer and Oehlert (1891 and 1892) have also paid some attention to spicules, and have sought to use them as specific characters, but it is to Blochmann (1906, 1908, 1912) that we owe our fullest knowledge of their usefulness in this respect. He has pointed out that within the same individual the spicules vary in shape from point to point, and that the figuring of isolated spicules is of little value for specific comparison. The shape and mode of arrangement of the spicules of any given part of the body, however, are within limits recognisably similar for different

* Page 21.

individuals of the same species and different for different species. These characters are difficult to define in words and recourse is therefore had to figures of definite districts of the body, of which the most useful for comparison are the ventral body wall and the side arms. All the figures are reproduced with the magnification of 45, in order to facilitate comparisons.

The technique of preparing the spicules for microscopic examination recommended by Blochmann is as follows:—by utilising the natural gape of the shell the desired parts of the body wall or of the arms may be cut away by suitable instruments without further damaging the specimen. Dried material is first soaked for some time away from air in old turpentine, and the mounting is done with gum damar. The arms of the larger specimens are best not mounted, but examined while immersed in turpentine, cedar oil, or fluid paraffine, as they can then be moved into any desired position.

As material for the study of the spicules of brachiopods is not readily available for practice in acquiring the technique, I venture to give in greater detail the procedure finally adopted by Professor Kirk and myself. The part which it is desired to mount is first cut away, and if dried, is soaked for some time in water, and all air-bubbles removed under an air-pump. The specimen is then, while still under water, placed between two stout cover glasses in the position in which it is desired to mount it. It is then transferred to alcohol to remove the water, two lots of alcohol being used, and then to clove oil. The upper cover glass may now be removed as the clove oil renders the object rigid in the desired position. If any air-bubbles still remain they are removed at this stage by the air-pump. The cover-glass and object are then lifted out of the oil and partially drained, and the object is then slid into the desired position on a slide on which a bed of canada balsam and xylol has been placed, and is covered in the usual manner.

There is no difficulty in mounting portions of the body wall or of the mantle unless these are so old as to have become very brittle, but the suitable mounting of the side arms of *Liothyrina* and *Liothyrella* is not always easy, owing to the shape of these organs and the position of the spicules. It is best to spread the arms out so that the dorsal and ventral parts of the arms are separated, keeping a note of which is the dorsal and which the ventral side, but that sometimes proves impossible, and it is then necessary to rely on an optical section to separate the spicules of the dorsal and ventral sides of the arms. In either case the side folds of the arms which often bear spicules are folded against the arms, and an optical section has to be relied upon. This militates against clear photographic representation of the spicules.

The punctation and shell structure of brachiopods has received renewed attention in recent years, particularly with a view to the use of these characters in classification, and rather divergent opinions have been expressed. The prisms of the prismatic layer of the shell meet the inner surface obliquely, and trace upon it a "mosaic," which varies in pattern in different species. For purposes of comparing

different species, Blochmann (1908), who has called attention to this character, figures the middle part of the ventral valve in front of the muscular impressions. It seems probable from the differences displayed by his figures that a study of the mosaic may prove of considerable value in distinguishing species which are similar in external form. Unfortunately this character can seldom be observed in fossils. The pores or tubules which penetrate the shells of many species also show considerable differences in certain cases. Blochmann makes measurements of the outer and inner diameter of the pores, and of the number per square millimetre, and recommends that the same district of the shell as mentioned above, viz., the middle of the ventral valve in front of the muscular impressions, be selected for comparison, and also that all figures be reproduced with a magnification of 100 diameters. For portraying the shell mosaic he has unfortunately chosen a magnification of 175, and in this has been followed by Eichler (1911) and Jackson (1912). As a figure of the mosaic of a punctate shell serves also as a figure of the pores, it is here recommended that a magnification of 100 be adopted for the figures of both structures.

Blochmann was able to show from a study of the pores that the specimens from Kerguelen Islands formerly identified as *Terebratella dorsata* belonged to a distinct species. In other cases, such as the genus *Liothyrina*, the differences between the species are so slight that a study of the pores does not assist in identification.

Percival (1916) has made a study of the punctation of certain English fossils, and especially the " density " or number of the pores per square millimetre, and finds that the range in the two species selected for close study is so great that this feature can have little value for specific distinction. He has certainly proved his case for the species studied, *Terebratula biplicata* and *T. punctata*, but it does not follow that species of other genera will show a similar behaviour. In the present collection the large and distinctive pores of *Magellania joubini* enable the young of this species to be easily distinguished from the young of other species of *Magellania* and *Macandrevia*, the latter having always relatively small pores, and it appears probable that a fuller use of these characters may prove of considerable value in other cases. Meanwhile it is desirable to have figures of both pores and mosaic of as many species as possible.

For counting the number of pores, Blochmann uses a netz-mikrometer. Percival adopts a camera giving a magnification of fourteen times, and isolates an area of 14 sq. mm. on the screen by cutting a hole of this size in a sheet of paper. In the absence of an ocular micrometer I have found the following a convenient procedure. A Dick-Swift petrological microscope is used, the tube and the eye-piece of which are slotted to receive certain accessory plates. In this slot is inserted a piece of Bristol board with a square cut out of it of such a size that it gives an area of 1 sq. mm. on the object with a given objective (1 inch). The size of the square is determined experimentally, using an ordinary stage micrometer for calibration. The data obtained by this method are lower in the same species than those obtained by Blochmann, but I have checked its accuracy by the camera method of Percival.

Superfamily CRANIACEA *Waagen.*

Genus Crania *Retzius*, 1781.

Genotype Anomia craniolaris *L.*

Crania joubini *sp. nov.*

(Plate XVI, figs. 18, 19.)

Habitat.—Station 9; lat. 65° 20′ S., long. 95° 27′ E. (Davis Sea), 240 fathoms, 24th January, 1914. Sea bottom, small rocks.

A single specimen of a dorsal valve of a species of *Crania* was dredged from Station 9. The shell was without any trace of the animal, and had evidently been dead for some time, as it contained the tube of a calcareous annelid on its inner side. In shape it is somewhat irregular, owing to a feeble development of the left posterior corner in the latest stages of growth, but the course of the growth lines shows that it has developed from a roundly rectangular shape, broader than long. The convexity is very slight, and the margins of the valves are not in one plane. The blunt apex is situated very close to the posterior border, where the steepest slopes exist. The shell also slopes more steeply to the right than to the left side, which is arched about halfway between the apex and the left anterior corner. Growth lines are not prominent except in the outer third of the shell. There is no trace of radial costation or striation. A light brown epidermis covers the greater part of the surface, but where this is removed, as on the apex and round the anterior margin, the shell is white.

In the interior there is a narrow, finely-granulated rim, limited by an indistinct shoulder. The muscular impressions are not strongly marked, and only the posterior and anterior adductors and one of the dorsal protractors can be distinguished under favourable conditions of lighting. The pallial sinuses have left no impressions. The fine punctation can be easily distinguished on the interior by the aid of a lens.

The dimensions of the specimen are—length 7·8 mm., breadth 9·2 mm., height 2 mm.

The shape and ornament of this specimen are approached more nearly by northern than by southern recent forms. The only species of the genus hitherto described from Antarctic waters, *Crania lecointei* Joubin, possesses a nearly central apex and growth lines which develop from rounded through elliptical to roundly ovate. These differences in shape and in development seem sufficient to prevent the association of the present specimen with that species.

The other forms from the southern seas, *Crania patagonica* Dall, from the west coast of Patagonia, *C. Suessi* Reeve, from East Australia, and *C. huttoni* Thomson, from New Zealand, have all a radiating ornament, and are thus clearly distinct. *Crania joubini* differs from *C. anomala* and other northern forms by its feeble convexity and the poor development of the muscular impressions.

The only known Tertiary fossil form of the genus from the Southern Hemisphere is the Australian *Crania quadrangularis* Tate, which is similar in form to the present species, but has fine radial striæ and strong muscular impressions.

NATIONAL MUSEUM MELBOURNE

Superfamily RHYNCONELLACEA Schuchert.

Genus Hemithyris *d'Orbingy*, 1847.

Genotype Anomia psittacea *Gmelin.*

Hemithyris striata *sp. nov.*

(Plate XVI, figs. 30, 31, 32, 45.)

Habitat.—Station 11, off Shackleton Glacier (Davis Sea), 358 fathoms, 31st January, 1914. Sea bottom, ooze.

There is from Station 11 a single ventral valve of a *Hemithyris* which must be referred to a new species. All trace of the animal had disappeared. The shell is of a dull white colour with a nacreous interior. It is roundly triangular in shape, with an acute apex, is lightly and regularly convex without fold or sinus, and the margins of the valves are in one plane. The surface is ornamented with a few strongly-marked lines of growth and very numerous fine radial striæ of somewhat uneven breadth, increasing in number towards the margin chiefly by intercalation, but occasionally by bifurcation. The beak is quite short, sub-erect, and possesses distinct beak ridges. The foramen may be described as hypothyrid, but a ventralwards movement has commenced and has just destroyed the apex, about 1 mm. of which has been removed. The narrow delthyrium is partially closed by lateral deltidial plates which pass ventrally into a short anteriorly excavate pedicle collar. The hinge teeth are close, and are supported by dental plates, which incline towards one another in the ventral direction and the free margins of which are arcuate anteriorly. Muscular impressions a dull white, small, not extending far forward. There is no trace of a median septum in the beak. Shell substance imperforate; the imbricated structure is easily visible on the interior by means of a lens. The shell is very thin, and the radial striation shows on the interior by transparence. The dimensions of the valve are—length 17·5 mm., breadth 18 mm., thickness 4·75 mm.

Three species of rhynconellids are known from Antarctic waters, viz., *Rhynconella racovitzae* Joubin (1901), *R. gerlachei* Joubin and *Hemithyris* sp. Jackson (1912). The first of these, *Rhynconella racovitzae*, was compared by Joubin to *R. cornea* Fischer, but it does not seem probable that these species are closely related. Joubin pointed out a difference in the course of the anterior commissure, viz., that the re-entrant angle is on the ventral valve in *R. cornea*, and on the dorsal valve in *R. racovitzae*, or in other words that *R. cornea* is incipiently ventrally uniplicate and *R. racovitzae* dorsally uniplicate.* Fischer and Oehlert's figures (1891) seem to show, however, that *R. cornea* possesses a faint sinus in each valve, and that the folding is really of the *Cincta* type. This suggests the possibility that *R. cornea* may belong to the genus *Frieleia*, in which a similar tendency to a folding of the *Cincta* type is evident,† and the cardinalia certainly seem to show an approach to the type described by Dall in *Frieleia halli*, although the hinge plates do not quite unite above the septum. *Hemithyris craneana* Dall is another

* Cf. Thomson, 1915, No. 1 for terminology. † Cf. Thomson, 1915, No. 3.

recent rhynconellid which shows a tendency to folding of the *Cincta* type, but which also differs from *Frieleia halli* by a separation of the crura or hinge-plates clear to the cardinal margin. The differences separating these two species from *Hemithyris* seem as important as those separating them from *Frieleia*, and they may be provisionally referred to as the *Rhynconella cornea* series. With this series *R. racovitzae* can have little relationship, and its dorsal uniplication is in accord with its reference to *Hemithyris*.

Rhynconella gerlachei is a shell in the lenticular stage, so that its type of folding gives no clue to its generic position. The cardinalia, however, are not of the Hemithyrid pattern, but present considerable resemblance to those of *Frieleia*, to which genus it may be provisionally referred until adult examples are discovered.

The fragments described by Jackson under the heading of *Hemithyris* sp. consist only of the posterior parts of valves, and consequently the type of folding is not known. From the other characters it seems probable that they belong to a new species of *Hemithyris* with the long beak which separates the *H. psittacea* series from the short-beaked *H. nigricans* series. A fossil member of the *H. psittacea* series, *H. antarctica*, has been described by Buckman (1910) from the Post-Tertiary Pecten Conglomerate of Cockburn Island, off Graham Land, and Jackson states that his specimens present some points of resemblance to this species.

The present species, *Hemithyris striata*, is an adult shell in the lenticular stage, and, as the dorsal valve is unknown, some uncertainty as to whether it belongs to *Hemithyris* or *Frieleia* must remain. It is not impossible, as far as shape and ornament are concerned, that it is the adult form of *Frieleia gerlachei*. It possesses the short beak of the *Hemithyris nigricans* series, but differs from these species (*H. nigricans*, *H. pyxidata*, *H. doederleini*) by the fineness of the radial ornament, as well as by the lack of folding. It is easily distinguished from *Hemithyris racovitzae* by its rounder shape and relatively lesser convexity as well as by the absence of folding. The only other southern species of rhynconellid not discussed above is the Australian form, *Hemithyris colurnus* Hedley, which, from characters of beak and cardinalia, must be referred to *Aetheia*, and therefore need not be further compared with our species.

Superfamily TEREBRATULACEA *Waagen*.

Family Terebratulidae *Gray*.

Genus Liothyrella *Thomson*, 1916.

Genotype Terebratula uva *Broderip*.

Liothyrella was founded to include a series of finely punctate recent and Tertiary terebratulids distinguished from *Liothyrina* and *Terebratula* by the possession of a low but sharp median septum in the dorsal valve, accompanied in many cases by an irregularly distributed fine radial ornament. All the known species, *L. uva*, *L. notor-*

cadensis (Jackson), *L. antarctica* (Blochmann), *L. fulva* (Blochmann), *L. blochmanni* (Jackson), *L. concentrica* (Hutton), *L. tateana* (Tenison-Woods), and the new species described below have a southern distribution and include Oligocene–Miocene southern fossils. Whether the other known southern recent species, *Terebratula moseleyi* Davidson, *Terebratula vitrea* var *minor* Davidson (not of Philippi), Cape of Good Hope, *Terebratula uva* Davidson (? of Broderip), Heard Island, and *Liothyrina winteri* Blochmann, belong also to this genus or to *Liothyrina* must remain uncertain until the presence or absence of the median septum has been ascertained.

From a study of the spicules occurring in the arms, Blochmann (1906 and 1908) divided the species then considered as *Liothyrina* into two groups, distinguished by the presence or absence of a row of spicules as the base of the cirri (Cirrensockel), which may conveniently be termed cirri socles. The group in which they are absent, which includes *Liothyrina vitrea*, occurs chiefly in the Atlantic Ocean and the Mediterranean sea, with the exception of one species in Japan and one off Madagascar, to which must now be added a species in Australia. The group in which they are present, which includes *Liothyrella uva*, embraces the majority of southern forms, and also one species each in the Arctic, the Mediterranean and the Panamic regions, while *L. uva* itself ranges from southern American waters as far north on the west coast as the gulf of Tehuantepec in Mexico. Blochmann's conception of the relationship of the various species with the latter group is of interest. From the fact that each of them has its peculiar district and does not transgress into the district of another, and from the further fact that these various districts hang together, he concludes that the smaller species, such as *artica*, *affinis*, *clarkeana*, *antarctica*, *davidsoni*, *winteri*, and perhaps *moseleyi* have arisen as local forms of a species which has gradually extended its distribution, each form corresponding to a new district which has been occupied. The occurrence of *arctica* between Iceland and Greenland and of *affinis* in the Mediterranean is difficult to account for on this theory, for the districts of these species do not join up to those of the southern forms. In any case such a theory of the relationship of the species of so old a genus seems much too simple to be credible, and takes no account of the extinct Terebratulids of the Tertiary.

From a study of the spicules in a series of *Liothyrella antarctica* in different stages of growth Eichler suggests the possibility that cirri socles may be present in the young stages of *Liothyrina vitrea* and other forms, their absence in adolescence being due to a later resorption.

Liothyrella fulva (Blochmann) furnishes a critical case for determining the value of Blochmann's two divisions. The similarity in shape of this species to *Liothyrella uva* caused Davidson to unite it with the latter. If the specimen described below is correctly assigned to *L. fulva*, the latter species agrees further with *L. uva* in the presence of a fine radial ornament, and is without doubt a species of *Liothyrella*. Nevertheless in *L. uva*, which is a smaller species, cirri socles are present, while in *L. fulva* they are absent. Blochmann's division, therefore, conflicts with a division of the species based

on shell characters; the latter are, in my opinion, more entitled to consideration in classification, more especially as they have been shown to exist also in Middle or Early Tertiary shells alike in the Antarctic, New Zealand and Australia, and are thus apparently characters of considerable permanence. The truth seems to be that the absence of cirri socles can be correlated with the size of the species whether it be referable to *Liothyrina* or *Liothyrella*.

Liothyrella fulva *Blochmann*.

(Plate XV, figs. 20, 21, 22; plate XVII, fig. 53).

1880. *Terebratula uva* (in part) Davidson, Voy. Challenger, Zool., vol. 1, Brachiopoda, pp. 31–32, plate II, figs. 3, 4 (not of Broderip).

1886. *Liothyris uva* (in part) Davidson, Trans. Linn. Soc., Zool., vol. 4, pt. 1, pp. 10–11.

1906. *Liothyrina fulva* Blochmann, Zool. Anz., Bd. XXX, p. 698.

1908. *Liothyrina fulva* Blochmann, Zeits. f. wissensch. Zool., Bd. XC, pp. 617–618, Taf. XXXVIII, fig. 22, a–b, Taf. XXXIX, fig. 26.

1914. *Liothyrina fulva* Blochmann, Pap. & Proc. Roy. Soc. Tasm. for 1913, pp. 112–114, plate X, figs. 1–6, plate XII, figs. 12a, 12b.

Habitat.—Off Maria Island, Tasmania, 12th December, 1912, 65 fathoms. Collected by Mr. T. T. Flynn. A single specimen.

The shell is white in colour, fairly large, elongate ovate with the greatest width about the middle, the sides obtusely angled, the front truncate and gently rounded. Both valves are convex, the ventral strongly so, and show neither fold nor sinus. The anterior commissures are straight. The hinge line is short and curved. The beak is moderately produced, erect, truncated by a fairly large foramen which is epithyrid and labiate, but does not entirely hide the narrow concave pseudodeltidium. The beak ridges are not prominent. The surface of the valves show numerous fairly prominent growth lines and a very fine radial ornament, only visible under favourable conditions of lighting.

The loop is short, extending only one-third the length of the dorsal valve, and is relatively narrow. The transverse band is composed of a broad ribbon, sharply arched in the middle to form a ventrally directed ridge. The crura are very short, but the crural bases relatively long and with broad triangular discrete hinge plates separating them from the widely diverging socket ridges. The cardinal process is lamellar and fairly high. The muscular impressions are fairly strong, those of the abductors being separated by a low but sharp median ridge running nearly to the umbo and showing clearly on the exterior of the shell.

The mantle has four sinuses in each valve but the middle pair are much more prominent, and corresponding to them are internal grooves in the shell. The sinuses

throw out several branches on each side, and the middle pair in each valve bifurcate broadly near the anterior margin, the outer branches again branching repeatedly. Spicules occur in the sinuses and all the branches, as well as in the body wall, around the mouth, and in the arms. The latter are short, with relatively short cirri which contain slender, elongate, overlapping rod-like spicules. The body wall is stiffened with interlocking stellate spicules containing each only a few " windows " in the central part, and the surfaces of these spicules are finely spinose. Those of the ventral body wall are stouter than those of the dorsal. The body having been dried and the cirri curled in before examination of the spicules of the arms, the latter could not be satisfactorily exposed, but the absence of cirri socles and the presence of numerous branch-like main plates below was determined and agrees with the account given by Blochmann for the specimens from Schouten Island. Length, 33 mm., breadth 23 mm., thickness 19 mm.

The specimen described above differs considerably both in size and beak characters from the type as figured by Davidson and by Blochmann. There are so many points of agreement, however, between it and the larger, more elongate, specimen described by Blochmann (1914) from Schouten Island, especially in the shape of the dorsal valve and the loop, and the spicules, that there can be little doubt that these are the same species. The more advanced beak characters of the present specimen, together with its larger size, may probably be correlated with its greater age.

Mr. C. Hedley has kindly lent me for comparison a specimen from Cape Byron determined by him in 1908 as *Liothyrina uva*. This consists of a ventral valve 16·5 mm. in length, and agrees closely in shape and beak characters with the present specimen, and like it possess a fine radial striation. It is also doubtless to be referred to *Lithyrella fulva*.

Liothyrella ovata *sp. nov.*

(Plate XVI, fig. 42; plate XVII, figs. 54, 55, 56; plate XVIII, fig. 63.)

Habitat.—Station 10; off Shackleton Glacier (Davis Sea), 325 fathoms, 29th January, 1914. Sea-bottom, ooze ; temperature 1·65° C. A single shell.

The shell is white in colour, ovate, with a blunt beak and a truncate front, the sides being rounded and passing gradually into the gently rounded front. The greatest width is very slightly in front of the middle. The hinge line is of moderate width and obtusely angled. Both valves are convex, the ventral more so than the latter. There is no marked sinus or fold on either valve, but a very faint indication of dorsal biplication. The lateral commissures are practically straight while the anterior commissure shows a very light ventral median depression corresponding to the median sinus of the dorsal biplication. The beak is short, sub-erect, without pronounced beak ridges, and is truncated by a fairly large epithyrid foramen, which is marginate and possesses a small pedicle collar within. The surface ornament consists of numerous not very pronounced growth lines, crossed by a rather widely spaced faint radial striation. Dimensions—Length 23 mm., breadth 19 mm., thickness 13 mm.

The loop unfortunately was broken before examination, but appears to have been short and moderately broad. The crura are very short, and the crural bases of moderate length, diverging rather rapidly, their free edges not raised above (ventrally of) the hinge plates, which are narrow. The cardinal process is small, low and transverse. The median septum is very slender, but is well defined and shows clearly on the exterior of the shell.

The mantle and the body walls appear to be free of spicules, while those in the arms are slender but exceedingly numerous. The long cirri of both inner and outer rows contain rather short and very irregularly bounded spicules in great numbers. The place of the cirri socles is taken by small crowded spicules of very irregular shape which penetrate into the bases of the cirri of the outer row, but not into those of the inner row. The main plates are slender and very irregularly branched, and are confined to the dorsal side of the arms.

Spicules are recorded as being absent from the cirri of *Liothyrina arctica*, *Liothyrella uva*, and *L. blochmanni*, and present in *Liothyrina vitrea*, *L. affinis*, *L. stearnsi*, *L. moseleyi* and *Liothyrella fulva*. In other respects the spicules of the arms of the present species differ widely from those of the five last named species, being perhaps most like those of *L. moseleyi*, but differing in that the main plates are confined to the dorsal sides of the arms. The shell resembles in beak characters the type of *Liothyrella fulva*, but is broader than that species, and also differs in its truncate front margin. In this respect it resembles *Terebratula moseleyi* Davidson, but it is less broad than that species. It approaches in shape very closely some examples of *Liothyrella tateana* (Tenison-Woods) from the Tertiary of Table Cape, Tasmania, but has a less advanced beak, the foramen being labiate in the latter species. *L. tateana*, moreover, attains a more pronounced biplication in many specimens, while in the uniplicate stage it is more strongly folded.

Liothyrella antarctica (*Blochmann.*)

(Plate XV, figs. 8, 9, plate XVIII, figs. 65, 66.)

1906. *Liothyrina antarctica* Blochmann, Zool. Anz., Bd. XXX, pp. 692–693, fig. 1.

1911. *Liothyrina antarctica* Eichler, Deutsche Südpolar-Exped., Zool., Bd. IV, Heft. IV, pp. 386–388, 397–400, Taf. XLII, figs. 1–4, Taf. XLIII, figs. 13, 19, 20, Taf. XLIV, figs. 25–34.

Habitat.—Station 2 ; lat. 66° 55′ S., long. 145° 21′ E. (off Adelie Land), 288–300 fathoms, 28th December, 1913. Sea-bottom, ooze; temperature 1·8° C.

A small series of specimens from Station 2 is ascribed to this species with some confidence, not only because of the general agreement in shell characters, but also on account of the close resemblance of the spicules to those of *L. antarctica* described by Eichler. The following description applies to the largest specimen of the series.

The shell is broadly ovate with rounded sides passing gradually into a rounded front. The greatest breadth is a little in front of the middle. The hinge line is of moderate breadth and obtusely angled. The convexity, in which the ventral valve assumes a slightly larger share, is only moderate. There is a slight tendency to dorsal uniplication, revealed chiefly by the arching of the anterior commissure, but also by a slight flattening towards the sides of the dorsal valve. The beak is rather short, suberect, without pronounced beak ridges, and is truncated by a fairly large epithyrid foramen, which is marginate with a well developed pedicle collar within. The growth lines are not well marked, and there is an almost obsolete faint radial striation only to be discerned with a magnifying lens.

In the dorsal valve the septum is not conspicuous, but may be clearly seen by holding the shell up against a strong light. The loop is short, extending forward only two-sevenths the length of the valve. The transverse band is relatively broad and presents two folds directed ventrally with a groove between them. The crural bases are longer than the sides of the loop, and the crural processes occur right at the end of the hinge plates. The crural bases diverge rather rapidly and are raised above (ventrally of) the hinge plates anteriorly and gradually descend to their level about halfway to the umbo. The hinge plates are concave ventrally. The cardinal process is low and very broad.

No spicules were observed in the sinuses of the mantle, or in the cirri, and they occur only sporadically in the body walls. In the arms they are well developed, consisting of a row of massive stellate main plates on both dorsal and ventral sides of the arms, and a row of pyramidal cirri socles at the base of the cirri on the dorsal side only. Both rows of plates vary considerably from place to place, the cirri socles in places losing their pyramidal shape by the development of a large spine in place of the base of the pyramid, and take the appearance of a cross. The main plates are roughly stellate with a small central disc, which is occasionally perforated by small " windows," while the rays have a tendency to bifurcate. The lateral branches in both series overlap one another. The general shape and the relationships of both rows of spicules agree with those described for *L. antarctica* by Eichler, though not so well in the shape of the main plates with the figure given by Blochmann. In a young specimen of 6 mm. the cirri socles continue from the dorsal side right to the proximal end of the ventral side of the side arms, *i.e.*, somewhat further than in the cases studied by Eichler.

The discovery of this species off Adelie Land represents a considerable extension of its range, the previous specimens being all obtained from the Winter Station of the " Gauss " in 385 metres depth (210 fathoms).

Liothyrella neozelanica *sp. nov.*

(Plate XVI, figs. 36, 37, 38; plate XVII, figs. 51, 52; plate XVIII, figs. 61, 62, 64.)

Habitat.—On a flat stone entangled on a fishing line of 200 fathoms length, Cook Strait, off Wellington, New Zealand.

About forty large and several minute shells belonging to a new species of *Liothyrella* were found on a large flat stone brought up on a fishing line, in Cook Strait. The depth cannot have exceeded 200 fathoms and may have been much less. Mr. T. Iredale, who kindly examined the associated molluscs, states that they are distinctly of shallow water facies, and probably from not more than 50 fathoms in depth. The specimens had been rotting for a fortnight before they were obtained by the Dominion Museum.

The shell is large, pale horn-coloured to white, and broadly ovate in shape with a blunt beak and a slightly truncate but gently rounded front. The hinge line is moderately broad and strongly angled at the dorsal umbo. The convexity is considerable, the greater share being assumed by the ventral valve. There is an obscure broad median fold in the dorsal valve, flattened on top anteriorly, and a corresponding very shallow anterior sinus in the ventral valve giving rise to a flattened dorsally directed arch in the anterior commissure. The beak is short, sub-erect, with blunt beak ridges and a large epithyrid foramen which is labiate with a well developed pedicle collar within. The pseudodeltidium is not entirely concealed by the labiate foramen, and is of one piece, rather low, moderately broad and concave dorsally. The umbo of the dorsal valve is considerably incurved, and is hidden by the pseudodeltidium. The surface of the shell show numerous fairly strong growth lines, and a very fine wavy radial striation, only clearly visible in a favourable light by the aid of a lens, but occasionally distinguishable by the naked eye. The dimensions of the specimen chosen as holotype, are—Length 47 mm., breadth 42 mm., thickness 29 mm.

The loop is short, extending forward little more than one-quarter the length of the dorsal valve. The crural bases are relatively long and project above the narrow hinge plates for nearly their whole length, being inclined slightly towards one another. The crural processes occur at the anterior ends of the hinge plates, and are long and pointed. The remainder of the primary lamellæ are very short. The transverse band is of only moderate length with a ribbon narrow at the points of origin and in the middle, but swelling out anteriorly on each side. It is strongly arched ventrally, the top of the arch being flattened for a short distance. The cardinal process is moderately developed, but appears prominent owing to the incurving of the dorsal umbo. The thread-like posterior dorsal septum is clearly marked, but does not show through the shell, which is moderately thick, and not markedly grooved internally for the reception of the pallial sinuses.

The sinuses of the mantle are narrow and not conspicuous in the dried shell. They send out many branches on each side alternately, and bifurcate repeatedly near the front margin, the branches uniting near the margin with those of the adjoining sinuses. Spicules are present both in the sinuses and in the branches. The body walls are braced with large interlocking spicules, which are more massive in the dorsal than the ventral portion; those of the dorsal body wall consist in the middle of large plates with dorso-ventral elongation of their rays and with few "windows," passing out on

the sides into stellate plates with spiny rays and large central discs presenting many "windows," and finally into more slender, much branched, irregularly shaped, plates resembling the latter, but with the "windows" so developed as to destroy the appearance of the central disc. The plates of the ventral body wall agree with the second and third types above described for the dorsal body wall.

The spicules of the arms and cirri, on the other hand, are relatively very slender. The row of main plates is stoutest on the dorsal side at the proximal end, and these consist of irregularly stellate plates of three or four primary rays, which quickly branch and bear spines, the branches having a tendency to curve to assume a dorso-ventral direction. These main plates have at first a small central disc with occasional small "windows," and when followed distally are seen to become more and more slender, common forms near the end of the arm being four-rayed stars like a Southern Cross or three-pronged spines of swastika shape. Similar forms but of decreasing size persist on the ventral sides of the arm and in the spiral arm, where still simpler forms with assegai or boomerang shapes occur.

The cirri of the inner row bear no spicules, while those of the outer row possess small, distantly-spaced, spindle-shaped rods. Into the base of the latter row of cirri there project small irregularly pointed but frequently pyramidal plates in a fairly definite row, which fails on the ventral side, except quite sporadically. It is separated from the row of main plates by an intermediate series of larger, similarly shaped plates, often resembling a twice-barbed arrow head with the points directed towards the cirri. This intermediate series, which is almost but not quite referable to a single row, persists on the ventral side almost to the proximal end.

The row of plates at the base of the cirri appears to be homologous with the more massive cirri socles of smaller shells. In the presence of the intermediate row, however, the arrangement of the spicules presents more resemblance to that shown by *Liothyrina vitrea* than by *Liothyrella uva*. The shell characters, however, and particularly the presence of the dorsal median septum and of the fine radial ornament prove the closer relationship of the species with the latter. The slender development of the spicules of the arms seems in this species and *Liothyrella fulva* to be a function of size.

The species is distinguished from other recent *Liothyrellæ* by its great size, and is to be compared with fossil forms in the Oamaruian of New Zealand, such as *L. gravida* (Suess) and *L. oamarutica* (Boehm). With the former it agrees in length, but is not quite so broad and not so angled at the sides. It agrees more nearly in shape with the latter, but is slightly broader, with broader youthful growth lines, and has a labiate instead of a marginate foramen. *L. oamarutica* in addition is frequently more strongly folded than any examples of the present species.

The young shell from Foveaux Strait, described by me in 1915 as *Liothyrina sp.*, possesses stout cirri socles, and much more massive spicules in the cirri, and is quite probably not the young of the present species.

Family Terebratellidæ *King.*

Subfamily Megathyrinæ *Dall.*

Amphithyris *genus nov.*

Genotype Amphithyris buckmani *sp. nov.*

Shell plano-convex, with beak characters similar to those of *Platidia*, viz., ventral valve with sharp beak ridges meeting in an apex dorsally of which there is an open triangular delthyrium; dorsal valve with a semi-circular foramen replacing the umbo. The pedicle opening consists of a triangular delthyrium behind and a semicircular foramen in front, and the very short pedicle issues perpendicularly to the flat dorsal valve, enabling the shell to lie close against its support with the convex limpet-like ventral valve uppermost. Buckman (1916) has shown that the foramen in terebratuloids may shift ventralwards of the beak ridges from the hypothyrid to the epithyrid position. In this and other similar cases the foramen has moved dorsally, resorbing the dorsal umbo. The name of the genus is intended to indicate the position of the foramen in respect of the valves, and this type may be called *amphithyrid.*

The genus is distinguished from *Platidia* by its more primitive lophophore and brachial support. The lophophore is in the stage termed by Beecher (1897) the schizolophous, with inwardly directed cirri, *i.e.*, the lophophore is relatively large and reniform, with a simple invagination in front dividing it into two lobes as in *Argyrotheca.* The lophophore of *Platidia* is much more complex, consisting of a small median posterior lobe or disc around the mouth with the cirri directed ventrally and outwards, and two larger symmetrical anterior lobes with the cirri directed dorsally and outwards. The lophophore in passing from the posterior into the two anterior lobes becomes twisted on itself. For a more detailed account the description of Fischer and Oehlert (1891) should be consulted. Beecher has cited *Platidia* as possessing the zugolophous type of lophophore, which is an intermediate stage between the schizolophous and the plectolophous, the latter being the final stage in the *Terebratulacea* with a well-developed median dorso-ventrally rolled spiral arm. The lophophore of *Platidia*, however, departs widely from the zugolophous stage as represented in young examples of the *Dallininæ* in the so-called Platidiform loop stage, and represents a special type of its own. Fischer and Oehlert (1891) have pointed out that a dorso-ventral rolling of a spiral arm is precluded in this genus by the restriction of the visceral cavity imposed by the flattening of the dorsal valve, and that the lophophore has had to develop in the plane of the commissures.

Amphithyris differs further both from *Argyrotheca* and *Platidia* in its brachial support, which consists solely of a centrally situated, fairly high, median septum, with no trace of descending or ascending branches of a loop. For the rest the lophophore is supported by spicules. In *Argyrotheca* there is a calcareous band roughly parallel to the sides of the shell, corresponding to the primary loop of higher forms. In *Platidia* the septum is placed more posteriorly, and has in consequence a shorter primary loop, and in addition a pair of prongs at the top of the septum.

NATIONAL MUSEUM MELBOURNE

Amphithyris is thus comparable to *Argyrotheca* in its type of lophophore, but has a more primitive type of brachidium, and in addition differs in beak characters, *Argyrotheca* having a hypothyrid foramen. It is comparable in shape and beak characters to *Platidia*, but has a more primitive type of lophophore and brachidium. The only other genus in which amphithyrid beak characters are attained is *Mühlfeldtia*. In *M. truncata* the dorsal umbo is only slightly notched, the dorsal valve is still convex and the lophophore is plectolophous. In *M. monstruosa* and *M. echinata* the dorsal umbo is deeply notched and the dorsal valve is flat or even slightly concave, while nothing is known of the lophophore. The loop of *Mühlfeldtia* is, of course, much more advanced.

Amphithyris must be placed at present in the subfamily *Megathyrinæ*, which includes those members of the *Terebratellidæ* which have not advanced beyond the schizolophous stage of lophophore, together with *Megathyris* itself in which the lophophore is pytcholophous, *i.e.*, with additional lateral lobation. It may be questioned, however, whether *Platidia* is correctly placed in the *Dallininæ*, and should not be regarded as the final member of a subfamily which should include *Amphithyris* and *Argyrotheca* (in part). *Platidia* differs from all other members of the *Dallininæ* in its loop, lophophore and beak characters and in the possession of spicules. *Argyrotheca australis* (Blochmann) has prongs rising from the septum very similar to those displayed by *Platidia*, and differs in its brachidium only in possessing short crura and long and strongly curved primary lamellæ. The lophophore, which is unknown, may confidently be expected to be intermediate between the simple schizolophous type and the type displayed by *Platidia*. *Magasella incerta*, Davidson, which Fischer and Oehlert refer with doubt to *Platidia*, has hypothyrid beak characters, and its loop resembles that of *Platidia* but lacks the prongs on the septum. If adult, it appears to constitute a new genus in the above series.

The only other species at present referable to *Amphithyris* is *Terebratula seminulum* Philippi, which was considered by Davidson (1887) as a synonym of *Platidia anomioides*, but which Fischer and Oehlert (1891) recognise as generically distinct, and perhaps a species of *Cistella* (*Argyrotheca*). This species has amphithyrid beak characters, a schizolophous lophophore, and apparently no primary loop lamellæ. It was placed by Davidson in 1852 in his new genus *Morrisia*, the type of which was left ambiguous. Davidson's first gave a diagnosis and figure of the shell now known as *Platidia anomioides* but gave no name, and then added as belonging to the genus *Morrisia seminula* Philippi. It was, therefore, a case of a genus with two genosyntypes, *Platidia anomioides* indicated by the diagnosis and figure, and *Morrisia seminula* indicated by name, but not definitely stated to be the type. Later in the same year Davidson recognised the ambiguity, and definitely selected *Platidia anomioides* as the type of *Morrisia*, which thus became an absolute synonym of *Platidia*, founded earlier in the same year. But for this unfortunate choice of Davidson's it would have been possible to employ *Morrisia* for the new genus here described and to avoid the introduction of a new name.

Amphithyris buckmani *sp. nov.*

(Plate XV, fig. 29; plate XVI, fig. 35)

Habitat.—With *Liothyrella neozelanica* on a stone entangled on a fishing line of 200 fathoms length, Cook Strait, off Wellington, New Zealand.

The shell is broadly sub-orbicular or roundly sub-rectangular, with an obtusely angled beak and a broad, nearly straight hinge-line, the greatest breadth being about the middle of the shell. The ventral valve is feebly convex, and the dorsal valve nearly flat, the commissures being straight. The beak ridges are sharp, and meet in an obtuse apex, which has not been notched by the foramen. The pedicle issues through an opening composed partly of a large open triangular delthyrium in the ventral valve, and partly of a large semicircular notch in the cardinal edge of the dorsal valve replacing the dorsal umbo. The surface of the ventral valve is ornamented with fine raised radial lines. The punctation of the shell is fine, and the pore density in the ventral valve 160. The dimensions of the shell are :—Length 5 mm., breadth 5 mm., thickness 1·25 mm.

The hinge teeth are situated at the anterior edges of the delthyrium and are small, and not supported by dental plates. There are a few spicules in the sinuses of the ventral valve.

The cardinal border of the dorsal valve is notched by a semicircular foramen between one-third and one quarter the total width of the valve. At the posterior corners of the foramen two short socket ridges project slightly beyond the cardinal border, leaving two small semicircular hinge sockets at their outer sides. There is no sign of crura or primary loop lamellæ. A simple thin septum, highest at its posterior end arises from the median line a little in front of the middle of the valve. The lophophore is reniform in shape, occupying five-eighths the length of the valve and seven-tenths of its width and has a slight forward indentation near the foramen, and a deep posterior invagination in front where it passes behind the septum. It contains a single row of cirri, which were strongly coiled towards the interior in the dead shell, and give a serrate appearance to the outer border of the lophophore. The cirri are apparently divided by numerous transverse partitions. The lophophore is supported by a row of spicules rising obliquely outwards from the floor of the valve and from the top of the septum. These spicules continue all the way around the lophophore and are most crowded behind the mouth, but in front of it there is a space free from them, bounded on each side by two large spicules which pass back from the posterior base of the septum like two large prongs.

Further material is necessary for a better knowledge of the viscera and the muscles. The single specimen had been dead and rotting for a fortnight before it came into my hands.

The species differs from *Amphithyris seminula* (Philippi) in the presence of the radial ornament in the ventral valve. That species has moreover a smaller dorsal foramen and a smaller and less invaginated lophophore according to Philippi's figures as reproduced by Davidson.

Subfamily Magellaninæ *Beecher.*

The subfamily *Magellaninæ* includes a number of genera with loops of a pre-Magadiniform, a Magadiniform, a Magelliform, a Terebratelliform, or a Magellaniform pattern, or of a pattern derived from one of these, each genus attaining its final loop form by a series of metamorphoses corresponding to all of the above patterns which precede it in the order above stated. Thus the genus *Terebratella* passes through pre-Magadiniform, Magadiniform, and Magelliform loop stages during development. There are, however, a number of different stocks which have by similar but independent series of loop metamorphoses attained Terebratelliform or Magellaniform loop characters, and it has been found that some of these stocks can be satisfactorily distinguished by characters of the beak and cardinalia. A study of the fossil forms of New Zealand and Australia with regard to these latter characters indicates that there are other forms with Terebratelliform or Magellaniform loops which cannot be placed in any of the known genera, and the same is probably true of some of the recent species that have been placed under *Terebratella* and *Magellania*. Comparisons of the fossil or of the existing faunas of the various southern lands and seas cannot possess much weight until these different stocks have been distinguished.

In the present collection there are two species for which new genera become necessary. These I propose as follows :—

Gyrothyris, genotype *Gyrothyris mawsoni* sp. nov., Macquarie Island, loop terebratelliform.

Stethothyris, genotype *Stethothyris uttleyi* sp. nov., Ototaran, New Zealand, loop magellaniform.

Gyrothyris stands in most of its characters between *Pachymagas* and *Terebratella*, but in beak characters it differs from both. These two last genera have a mesothyrid foramen with fairly well-marked beak ridges, whereas in *Gyrothyris* beak ridges are practically absent. There is a difference between the hinge teeth of *Terebratella* and *Magellania* on the one hand and *Pachymagas* and *Neothyris* on the other, to which attention has not previously been called. In the former pair the hinge teeth are rather slender and spring from the overhanging dorsal sides of the posterior part of the ventral valve. Their bases are not greatly swollen and do not interrupt the internal curvature of the valve at the points of origin, the inner and outer surfaces being approximately parallel. In *Pachymagas* and *Neothyris* the hinge teeth are larger and spring from swollen bases which depart greatly from parallelism to the outer surface and considerably restrict the beak cavity. In *Gyrothyris* the teeth resemble those of *Pachymagas* in these respects.

In *Terebratella* the septum joins the cardinalia without bifurcation and the hinge trough is enclosed by two flatly inclined and excavate hinge plates. The cardinal process is confined to the umbonal region and is transverse. The cavities between the hinge plates and the floor of the valve also penetrate to some extent under the floor of the hinge sockets. In *Pachymagas* no such cavities exist, and there are no excavate hinge plates. The floor of the hinge sockets is a raised solid platform at the posterior end of the valve. The septum bifurcates before reaching the cardinalia, the socket ridges are swollen and firmly united with the crural bases, and the hinge trough lying between them is more or less completely occupied posteriorly by a prominent cardinal process. In *Gyrothyris* there is no cavity below the hinge trough or the base of the hinge sockets, both being floored by a solid platform. The septum bifurcates narrowly on top just before reaching the cardinalia, but the hinge trough is shallow and obtuse. The cardinal process is confined to the umbonal region and is transverse as in *Terebratella*.

Gyrothyris resembles *Pachymagas* more than *Terebratella* but differs from the former in the absence of beak ridges, the shallowness of the hinge trough, and the transverse nature of the cardinal process. Further, *Gyrothyris mawsoni* possesses a radial ornament which has never been observed on any species of *Pachymagas*. The genus is probably of similar antiquity, for in the uppermost Mount Brown limestone of the Weka Pass district, Canterbury, New Zealand, there is an unnamed species with exactly similar shape and beak characters, although larger in size and without radial ornament. The age of the rock in which it occurs is Awamoan, probably Upper Miocene.

All the other recent species with Terebratelliform loop from the southern seas appear with one exception to be correctly referred to *Terebratella*, viz., *T. dorsata* (genotype), *T. dorsata submutica* Fischer and Oehlert, *T. sanguinea* Leach, *T. sanguinea* var. Thomson, *T. rubicunda* Sow., *T.* cf. *Magella carinata*, Thomson, and *T. mayi* Blochmann. The above list omits the doubtful *Terebratella rubiginosa* Dall,* concerning which very little is known. The exception referred to is *Terebratella* sp. Jackson (1912) from the Burdwood Bank, in which Jackson states that the "well-developed cardinal plateau is fixed to the bottom of the valve, and depressed longitudinally in the form of a trough." The cardinal process is Terebratelliform, the foramen apparently submesothyrid with discrete deltidal plates and with well-marked beak ridges. This species appears to belong to a new genus.

Stethothyris approaches *Neothyris* most nearly in its beak and hinge characters, but it appears to belong to an older stock which attained Magellaniform loop characters independently. There can be little doubt that the various species of *Neothyris* have developed from species of *Pachymagas* of the type of *P. parki* (Hutton). The earliest known species of *Neothyris*, *N. novara* von Ihering, appears in the Awamoan of New Zealand. The *Pachymagas parki* group flourished in the preceding stage, the Hutchinsonian, although their range is somewhat greater, while *Stetothyris uttleyi* is confined, so

* Dr. Dall has kindly re-examined the cardinalia of this species and states *in litteris* that they are Terebratelliform, and not Terebratiform.

far as present knowledge goes, to the Ototaran, which is a still earlier stage. The ventral valve of *Stethothyris uttleyi* shows no great difference from that of *Neothyris*, the foramen being rather small, mesothyrid, attrite, with fairly well marked beak ridges. The hinge teeth are rather small and the bases not greatly swollen, except in old shells, but the beak cavity is considerably restricted by a general posterior thickening of the shell. The muscular impressions are well marked, as in *Neothyris*, with a raised median ridge between the adductor impressions.

In the dorsal valve (Plate XV, fig. 26) the septum bifurcates narrowly before joining the cardinalia. There is a solid raised platform at the posterior end of the shell above which the cardinalia rise and below the surface of which the hinge sockets are slightly countersunk. There are no excavate hinge plates. The crural bases are considerably swollen, lying within the diverging socket ridges, and they nearly unite posteriorly, leaving between them a hinge trough which is long, narrow and shallow. The cardinal process consists of three parts, a slightly raised central boss similar to that of primitive *Pachymagas* (cf. Thomson, 1915, No. 1, fig. 2a) and two lateral swellings which project on each side of the umbo and at first sight seem to be backward continuations of the socket ridges.

The principal differences between the cardinalia of *Stethothyris* and *Neothyris* may be summed up by stating that in the former the hinge trough is shallower and longer and the cardinal process less advanced, not filling the hinge trough.

In the only example of *Stethothyris pectoralis* (Tate) in which I have been able to expose the cardinalia, there is a similar arrangement of the parts (Plate XVII, fig. 60), but the hinge trough is almost non-existent apparently owing to abnormal growth. Neither the crural bases nor the lateral parts of the cardinal process are so swollen.

In *Stethothyris antarctica* sp. nov. the cardinalia almost exactly reproduce those of *S. pectoralis*, with the difference that the hinge trough is well defined and the cardinal process a little less advanced, being transverse and little different from that of *Terebratella*.

By the recognition of this genus it now becomes possible to obtain a clearer idea of the history of the forms previously placed under *Magellania*. *Rhizothyris*, so far as is at present known, is confined to the Oamaruian of New Zealand, [*R. rhizoida* (Hutt.), *R. curiosa* Thomson] and the older Tertiary of Australia [*R. corioensis* (McCoy)], and did not survive into the Wanganuian of New Zealand, although possibly, as is suggested below, it may have survived to a later date in other areas. *Stethothyris* occurs in the Ototaran (middle Oamaruian) of New Zealand (*S. uttleyi* Thomson) and the older Tertiary of Australia [*S. pectoralis* (Tate)], and still survives in the Antarctic seas (*S. antarctica*). *Neothyris* first appeared in the Awamoan (Upper Oamaruian) of New Zealand [*N. novara* (von Ihering)], was abundant in the Wanganuian of that country [*N. ovalis* (Hutton), *N. campbellica* (Filhol) and other unnamed species], and still lives in the New Zealand seas (*N. ovalis*, *N lenticularis* (Desh)]. *Magellania* is not found

either fossil or recent in New Zealand, but occurs in the seas of Australia [*M. flavescens* (Val.)], the Macquarie Islands (see postea), and the Antarctic (*M. joubini* Blochmann), and in South America. How far back into the Tertiary of Australia it extends is not yet exactly known, but some of the Table Cape fossils are undoubtedly true *Magellaniae*. There are still other stocks as yet undifferentiated in the older Tertiary of South America and Australia.

The position of many recent species commonly ascribed to *Magellania* is difficult to decide from the published descriptions and figures, because at the time these were made the characters of the beak and cardinalia were not considered of such importance as those of the general shape, the terminology employed in description did not lend itself to exactitude, and no great care was employed in depicting these characters.

In *Magellania*, *Stethothyris*, and *Neothyris* the foramen is mesothyrid, while in *Rhizothyris* it is permesothyrid. The chief difference in beak characters between *Magellania* and *Neothyris* lies in the sharpness of the beak ridges, which are always more obtuse and less pronounced in *Magellania*. *Anomia venosa* Solander is a species with beak characters more like those of *Neothyris* than *Magellania*. The cardinalia depicted by Davidson (1886, plate VIII, fig. 5) seem to be Magellaniform, but the description and figures of Fischer and Oehlert (1892, plate XI, fig. 16) indicate rather a Neothyroid type, although the cardinal process recalls that of *Rhizothyris*. Until the cardinalia have been redescribed from a modern standpoint, this species is best left in *Magellania sensu lato*.* *Terebratula fontainei* d'Orbingy has much external resemblance to *Neothyris ovalis*, but I have been unable to glean anything about its type of cardinalia in the literature available to me. As it is regarded by some as a synonym of *Magellania venosa*, it is also temporarily placed in *Magellania sensu lato*.

Waldheimia kerguelensis Davidson possesses cardinalia which from Davidson's figures (1880, plate III, figs. 8, 9; 1886, plate X, figs. 16, 17) are neither Magellaniform nor Neothyroid, but recall in the simple unbifurcated septum those of *Rhizothyris*. The figures for the most part indicate a mesothyrid foramen, but in one (1886, plate X, fig. 8) the foramen appears to be permesothyrid. There is thus uncertainty as to whether this species is referable to *Rhizothyris* or belongs to a distinct stock. The Kerguelen specimen figured by Eichler (1911, Taf. XLII, figs. 7, a, b, c; Taf. XLIII, fig. 16) has a submesothyrid foramen and apparently Magellaniform cardinalia, and appears to be the young of a quite distinct species, probably a true *Magellania*. Until a better specimen is forthcoming to serve as a type, it is not desirable to rename it. The cardinalia of *Magellania fragilis* Smith have not been described or figured, so that it is impossible to place the species. In general, however, the shell of Magellania is more fragile than that of *Neothyris* or *Rhizothyris*. Finally *Waldheimia wyvillei* Davidson is a species whose cardinalia as figured by Davidson (1880, plate III, fig. 13b; 1886, plate X, fig. 6) do not agree with any of the known types.

* The examination of specimens recently received indicates that the cardinalia are Magellaniform, but the foramen is becoming permesothyrid (January, 1918).

Genus STETHOTHYRIS *Thomson*, 1918.

STETHOTHYRIS UTTLEYI *sp. nov.*

(Plate XV, figs. 27, 28.)

In order to base a new genus on this species, it is necessary to give here a brief diagnosis. The internal parts have already been described. The shell is of moderate size, elliptical, with gently rounded sides and a truncate front. The hinge line is of moderate breadth and obtusely angled. The lateral commissures are nearly straight, but the anterior commissure shows a flat-bottomed ventral depression of moderate width, corresponding to which there is a shallow anterior median sinus in the dorsal valve and an obscure median fold in the ventral valve, flattened anteriorly. The valves are moderately and nearly equally convex, the greatest thickness of the ventral valve being about the middle, and of the dorsal a little anterior to the middle of that valve. The beak is of moderate length, sub-erect, with fairly prominent beak ridges and a rather small mesothyrid foramen. The deltidial plates are fairly high and are transversely striated, often with a prominent median cord. The species differs from *S. pectoralis* (Tate) in its much shorter median dorsal sinus, its less incurved beak and correspondingly less convex pseudodeltidium, and its broader hinge line.

Type locality.—Tuff band, Weston's Quarry, Weston, near Oamaru, New Zealand. Horizon Ototaran, probably Lower Miocene. The species was discovered by Mr. G. Uttley, after whom it is named.

The holotype is not the specimen here figured, and is in the Dominion Museum, Wellington.

STETHOTHYRIS ANTARCTICA *sp. nov.*

(Plate XV, figs. 24, 25, 26; plate XVI, fig. 39.)

Habitat.—Station 10; off Shackleton Glacier (Davis Sea), 325 fathoms, 29th January, 1914. Sea-bottom, ooze; temperature 1·65° C.

The material consists of the united posterior end of both valves, and a separate fragment apparently of the anterior and left side of the ventral valve of the same specimen. The shell was evidently larger in size than any known Antarctic species, and must have been 50 mm. or more in length. The ventral valve is strongly convex, and the dorsal much less so. The beak has only moderately pronounced beak ridges and a fairly large mesothyrid foramen. The dorsal view of the united parts strongly recalls that of *Magellania venosa* as figured by Fischer and Oehlert (1891, plate XI, figs. 12, 13), but the characters of the cardinalia of the dorsal valve prevent an association with that species or with *Waldheimia kerguelensis* Davidson. The septum bifurcates narrowly before joining the cardinalia, and the two branches, instead of uniting with the crural bases, as in *Neothyris*, run backwards towards the cardinal process, which is small and transverse as in *Magellania*. The socket ridges are very massive and broad posteriorly. The branches of the bifurcating septum overhang somewhat on each side,

as if in process of evolution to hinge plates of the Magellaniform type, but the process is not far advanced. The shell substance is thick, and the pores rather large and circular, with a density of only 60 to 70 on the fragment of the anterior border.

The type of cardinalia above described agrees so nearly with that of *Stethothyris pectoralis* Tate (plate II, fig. 2) that there can be little doubt the two species are congeneric. Although the material is fragmentary the characters of the cardinalia render the identification of more perfect examples easy, and for the purposes of convenient reference I venture to give the species a name.

Genus GYROTHYRIS *Thomson*, 1918.

GYROTHYRIS MAWSONI *sp. nov.*

(Plate XV, Figs. 1, 2, 3, 4, 5.)

Habitat.—One mile off south end of Macquarie Island.

Shell ovato-triangular, with a narrow beak and rounded sides and front, the latter slightly produced. The hinge line is narrow and strongly curved. The dorsal valve is only moderately convex, with steep slopes near the umbo, and an indistinct frontal sinuation. The ventral valve is strongly convex posteriorly, becoming flatter in front, and has an indistinct median fold. The commissure is straight on the sides and shows a broad, shallow ventral depression in front. The beak is of moderate length, narrow but swollen, erect, and without pronounced beak ridges. It is truncated by a foramen of moderate size, apparently mesothyrid in position and attrite in condition. The pseudodeltidium is almost hidden, and is low, narrow, and concave. The surface of the single specimen is much obscured by encrusting bryozoans, but shows fairly strong growth lines, and an obsolete radial costation a little more prominent than that present in *Terebratella rubicunda* and of similar fineness. This radial ornament is not brought out in the illustration owing to lighting of the specimen from both sides. Owing to the encrusting organisms, the pores could not be counted.

The characters of the interior and the relationships of the species have been described above.

Genus MAGELLANIA *Bayle*, 1880.

Genotype TEREBRATULA FLAVESCENS *Val.*

MAGELLANIA JOUBINI *Blochmann.*

(Plate XV, figs. 6, 7; plate XVI, figs. 33, 34, 41.)

1906. *Magellania joubini* Blochmann, Zool. Anz., Bd. XXX, p. 697.

1907. *Magellania sulcata* Smith, National Antarctic Expedition, 1901–1904. Natural History, Zoology, vol. 11, Brachiopoda, pp. 1, 2, figs. 3, 4.

1908. *Magellania joubini* Blochmann, Zeitschr. f. wissensch. Zool., Bd. XC, p. 609.

1911. *Magellania joubini* Eichler, Deutsche Südpolar-Exped. 1901–1903, Bd. XII (Zool. Bd. IV), Heft. IV, pp. 388–390, Taf. XLII, figs. 5a–c, 6a, b, Taf. XLIII, figs. 17, 18, Taf. XLIV, figs. 23, 24.

1911. *Campages joubini* Hedley, Commonwealth of Australia. Fisheries. Zool. Res. F.I.S. "Endeavour," 1909–1910. Part 1, p. 114.

Habitat.—Station 2, lat. 66° 56′ S., long. 145° 21′ E. (off Adelie Land), 288–300 fathoms, 28th December, 1913. Sea-bottom, ooze ; temperature 1·8° C.

Station 3, lat. 66° 32′ S., long. 141° 39′ E. (off Adelie Land), 157 fathoms, 31st December, 1913. Sea-bottom, ooze ; temperature 1·62° C.

Station 8, lat. 66° 8′ S., long. 94° 17′ E. (Davis Sea), 60 fathoms, 27th January 1914. Sea-bottom, red algæ and small rocks.

The only adult shell of this species from Station 3 may be described as follows :— Shell in shape resembling a lozenge with rounded edges, considerably longer than broad, greatest breadth slightly posterior to the middle, rapidly tapering to a narrow, nearly straight front, the sides uniting with the front in marked angles. Hinge line rather broad and very obtusely angled. Dorsal valves lightly convex, flattened on top, ventral valve strongly convex with a broad median fold. Anterior commissure, with a shallow, broad ventral sinuation. Beak of moderate length, erect, beak ridges rounded but distinct, foramen of moderate size, mesothyrid, attrite ; pseudodeltidium rather narrow and low, concave. Surface of valves marked with numerous strong growth-lines crowded anteriorly, giving rise to a lamellar structure. Shell substance thin, pores very large, 96 to 108 to the square mm.

The loop is relatively as fragile as the shell, and parted entirely from the crura in an effort to remove the arms and other soft parts, but it was observed to be of typical Magellaniform pattern, with a very slender ribbon. The septum extends barely to the middle of the valve. The excavate hinge plates are narrow and steeply inclined, and the cardinal process is small.

The above specimen differs somewhat in outline from the forms of *Magellania joubini* previously described, but it possesses the chief distinguishing characteristics of that species, viz., the thin shell with large pores and the strong concentric "sulcations." These features thus appear to mark off from other species of *Magellania* a series of shells exhibiting considerable variety of form, and it seems best to group them together under one species.

The other examples from Stations 2, 3, and 8 are all young or half-grown shells, but they are all easily distinguished from the other associated species by the coarse punctation of their tests. One of 9 mm. in length from Station 8 has a pore density of 124. Some of these specimens enable the younger stages of the loop to be observed,

the youngest being in the Magelliform stage. The chief peculiarity of the series lies in the obliquity of the attachment of the jugal band in the Terebratelliform stage, and of the remnants of this band in the early Magellaniform stages, one of which is shown on plate XV, fig. 6.

Magellania macquariensis *sp. nov.*

(Plate XV, figs. 13, 14, 15, 16, 17; plate XVI, fig. 40.)

Habitat.—"On beach above present high-water level, Wireless Cove, north-west end of Macquarie Island, over an extent of $\frac{1}{4}$ mile."—H. Hamilton.

Some thirty specimens of this polymorphic species were obtained above the normal high-water on the beach of Wireless Cove, but as several of them contain the dried animal it is evident that they were recently cast there by a high sea, probably during a storm.

There is considerable diversity in shape, between the extremes shown in plate XV, figs. 13 and 15, but roundly ovate shells with a broad hinge line and a slightly produced front predominate. The growth lines in all cases indicate development from a roundly ovate form, but in a few cases the adults are much longer than broad. The specimen chosen as holotype has the following dimensions:—Length 26 mm., breadth 24 mm., thickness 15 mm. The shell figured in plate XV, fig. 15, is the only one showing a truncate front margin, which is due to a sudden reduction anteriorly of the broad ventral fold. The diversity in form, taken together with the frequency of unsymmetrical and distorted shells, may probably be correlated with diversity of environment such as is to be found in a shallow and stony bottom within range of current action.*

The dorsal valve is only moderately convex, but the slopes leading to the umbo are steep. There is a median sinus which is generally rather narrow and shallow, giving rise to a simply curved ventral sinuation of the anterior commissure. In a few cases it is narrow, but fairly deep, and again in others it is broad and shallow, causing a nearly flat-bottomed ventral sinuation in the anterior commissure. The ventral valve is more convex than the dorsal, and presents an obscure median fold. The lateral commissures are straight.

The beak is of moderate length, is sub-erect to erect, and bears fairly strong but blunt beak ridges. The large rounded foramen is mesothyrid in position and attrite in condition, but it is not completed dorsally by the deltidial plates, which are discrete in every case, allowing the dorsal umbo to project into the foramen.

The test is moderately thick, and is generally in a rough condition exteriorly. The growth lines are prominent, and there is no trace of radial ornament. The pores are of moderate size and number 108 to the square millimetre.

* Distortion of brachiopods is frequently caused by the fry settling in the mouth of a boring, the diameter of which is too small to accommodate the adult shell. This is well exhibited in the series of *Liothyrella neozelanica*, described above.

In the ventral valve the hinge teeth spring from the sides of the valve, and are not supported by dental plates. The cardinalia, septum and loop of the dorsal valve are all typically Magellaniform. Compared with *Magellania flavescens*, the septum is short, the hinge plates broader and less pointed in front, the cardinal process broader, and the loop more delicate. In the fully grown specimen no trace of the connecting band with the septum remains, not even in the form of a projection on the dorsal side of the primary lamellæ, but in a specimen of 13 mm. in length, the connecting bands almost reach the septum as two needle like spurs. A young individual of 6 mm. in length is in the Magadiniform loop stage.

The species with which *Magellania macquariensis* is to be compared is undoubtedly *Waldheimia smithi* Pfeffer from South Georgia, known from a single individual. Some of the Macquarie Island specimens agree in many respects with Pfeffer's figure, but they lack the anterior indentation of that species, and the youthful growth lines are sub-orbicular instead of being elongated ovate with a straight front. Further study will probably reveal other differences between the species, the internal characters of *Waldheimia smithi* being as yet unknown.

Genus Terebratella *d'Orbigny*, 1847.

Genotype Anomia dorsata *Gmelin.*

Terebratella sanguinea (*Leach.*)

1814. *Terebratula sanguinea* Leach, Zool. Misc., p. 76, tab. XXXIII.

1817. *Terebratula cruenta* Dillwyn, Descript. Cat. Recent Shells, vol. 2, p. 295.

1841. *Terebratula zelandica* Deshayes, Revue Zool. Soc. Cuv., p. 359.

1846. *Terebratula rubra* Sowerby, Thes. Conch., vol. 1, p. 345, plate LXVIII, figs. 9–11 (not of Pallas).

1852. *Terebratella Evansii* Davidson, Proc. Zool. Soc., p. 77, plate XIV, figs. 7–9.

1905. *Terebratella sanguinea* Hutton, Trans. N.Z. Inst., vol. 37, p. 447.

(For fuller synonymy consult Davidson, Trans. Linn. Soc., vol. 4, pt. 2, p. 87, 1887 and Suter, Man. N.Z. Moll., p. 1074, 1913.)

A single specimen of 7 mm. length dredged in 40 fathoms from the east of Enderby Island, Auckland Islands, by Mr. Edgar Waite, agrees well with young examples of the common New Zealand species *Terebratella sanguinea*. It has not before been recorded from the outlying islands of New Zealand.

Terebratella vel Magellania *sp.*

(Plate XV, figs. 11, 12.)

Habitat.—Station 10; off Shackleton Glacier (Davis Sea), 325 fathoms, 29th January, 1914. Sea-bottom ooze, temperature 1·65° C.

The single specimen is small, translucent white, broadly ovate to lozenge-shaped in shape with a broad obtusely angled hinge line. The sides are rounded, passing without a marked angle into the slightly truncate but gently rounded front. The convexity is moderate, the ventral valve taking the larger share. There is a faint anterior median sinus in the dorsal valve producing a ventrally directed sinuation in the anterior commissure. The beak is blunt, short, sub-erect without marked beak ridges, truncated by a submesothyrid foramen which opens into a delthyrium only partially closed by lateral deltidial plates. The surface of the shell is smooth, with feebly developed growth lines, not crowded anteriorly, indicating a youthful shell. The pores are moderately large, but not so large as in *M. joubini*, the pore density being low, only 70 per sp. mm.

The loop is in a late Terebratelliform stage and extends forward to three-quarters the length of the dorsal valve; the ascending branches are broader than the descending, and occupy only one-third the breadth of the valve. The septum and cardinalia are of the Magellaniform pattern with narrow and short hinge plates.

As the specimen is apparently not fully grown, it is uncertain whether it should be referred to *Terebratella* or *Magellania*. In shape it lies between *Magellania joubini* and *M. fragilis* Smith, and is broader than specimens of the former of the same length, and narrower than growth lines of the latter at the same length. From *M. joubini* it is further distinguished by the absence of the strong growth lines of that species and by the smaller pores. Although the less developed beak characters, as compared with *M. fragilis*, might be considered as due merely to its youth, the more advanced folding in so much smaller a shell shows that it cannot be the young of this species. It is probably the young of a new species.

Dimensions—Length 13 mm., breadth 11·5 mm., thickness 6·5 mm.

Magellania (?) *sp.*

(Plate XV, fig. 23.)

Habitat.—Station 2, lat. 66° 55′ S., long. 145° 21′ E. (off Adelie Land), 288–300 fathoms, 28th December, 1913. Sea-bottom, ooze; temperature 1·80° C.

A series of small specimens, from 6 mm. to 12 mm. in length, and all obviously young shells, must apparently be referred to a new species. As in the case of the last described specimen, the generic position must remain uncertain until adult shells have been examined. None of the present series have passed the Magelliform stage, and they may be referable to *Magella*, *Terebratella* or *Magellania*.

The largest specimen (length 12 mm., breadth 10 mm., thickness 5 mm.) is regularly ovate with a hinge line moderately broad and obtusely angled. The convexity is slight, the greater part being taken by the ventral valve. There is no marked sinus in the dorsal valve, but a gentle and broad ventral sinuation in the anterior commissure. The beak is short, sub-erect, with moderate beak ridges and a relatively

large mesothyrid foramen not separated from the dorsal umbo by the deltidial plates, which are small and discrete. There are rather prominent growth lines in the first half of the shell, and again at three-quarters, the remainder of the shell being smooth. The pore density is 80 per sq. mm.

The septum is long and junctions behind with cardinalia of the Magellaniform pattern. The loop is in the Magelliform stage.

The other specimens agree nearly enough in all essential characters but are on the whole broader. They show a pore density of 70 to 87.

The smallest specimen of 6 mm. in length deserves special mention. It was at first thought to be a specimen of *Macandrevia* in the Platidiform loop stage, but it does not possess dental plates which were observed in an undoubted *Macandrevia* of the same length in the present collection (see below), and moreover it possesses Magellaniform hinge plates. It must be regarded as in an abnormal Magadiniform loop stage in which the primitive hood has not yet been converted into a ring while the attachment of the primary lamellæ has become very oblique and nearly reached the position usually attained in the Magelliform stage. This specimen shows a tendency to a straight front and is perhaps a different species from the others.

Subfamily DALLINIAE *Beecher.*

Genus MACANDREVIA *King*, 1859.

Genotype TEREBRATULA CRANIUM *Müller.*

MACANDREVIA LATA *sp. nov.*

(Plate XVI, fig. 44; plate XVII, figs. 46, 47, 48, 49, 50.)

Habitat.—Station 10; off Shackleton Glacier (Davis Sea), 325 fathoms, 29th January, 1914. Sea-bottom, ooze; temperature, 1·65° C.

Material : one fragment of a dead shell and eight specimens taken alive, of which only four are fully adult.

The shell is broadly ovate, as broad as long, and in shape most resembles *Macandrevia americana* Dall (1895) and *M. vanhoffeni* Blochmann (1906) but is even broader than these species, and differs from both in possessing a straight instead of a rounded front. The hinge line is rather short and obtusely angled. The ventral valve is moderately convex and the dorsal valve flatter, the species repeating in these respects the proportions of *M. americana* and differing from *M. vanhoffeni*. There is no marked fold or sinus on either valve, and the commissures are practically plane, but a tendency to anterior retardation of the *Cincta* type is perhaps evidenced by a slight anterior flattening along the middle line of each valve, giving rise to the straight front. This flattening is, however, rather more pronounced on the dorsal valve. A similar

phenomenon has been described in *M. cranium* by Fischer and Oehlert (1891, p. 72), while a straight front is also exhibited by *M. craniella* Dall (1895). On the other hand *M. diamantina* Dall has a well-marked ventral uniplication.

The beak is short, and sub-erect to erect, as is usual in species of this genus. Beak ridges are not well-defined, but appear to point dorsally of the foramen, which is thus permesothyrid in position. The foramen, however, merges dorsally into an open delthyrium, with only very feebly developed lateral deltidial plates. Within the beak there is a deposit of callus, resembling a pedicle collar, but closely applied to the bottom of the valve, passing up in front laterally into the dental plates, which support small teeth. A similar deposit of callus is described by Dall in *M. americana*, while in *M. cranium* it is figured, although not described, by Fischer and Oehlert (1891, plate V, fig. 10 f.). The deltidial plates are very feebly developed and less prominent than in *M. americana*.

In the dorsal valve, the loop is long, extending forwards three quarters the length of the valve, when it is sharply recurved and gives off a few spinules on each side. The transverse band is narrow, its greatest width of the loop occupying only about a third of the breadth of the valve. The average breadth of the ribbon does not exceed one millimetre, except in the neighbourhood of the crural processes, which point ventrally inwards and are approximate. The crura are very short and spring from crural bases which are fused laterally on their outer margins with the short, widely diverging socket ridges. There is no median septum in the adult shell, while the hinge plate is represented by two lamellae which descend steeply from the inner sides of the crural bases to the floor of the valve a little more than one mm. on each side of the middle line, and are excavate anteriorly on their outer sides. These lamellae appear to be continuous across the floor of the valve along the middle line of the valve, closely applied to the bottom, extending back right to the neighbourhood of the umbo, and forward beyond their lateral free anterior edges for a slightly greater distance. In front of them there are three raised thread-like lines extending forward a short distance.

The surface of the shell is smooth, with only occasional traces of a radial ornament such as is described in the next species. The lines of growth are mostly very fine, but a few well-marked growth pauses may be seen on all the specimens. The shell substance is delicate. There are 80–112 pores per sq. mm., the pore density being somewhat variable on the same specimen, but a little lower than in *M. vanhoffeni* (120–132) though in view of the variability in this respect displayed by species of *Macandrevia*, too much importance must not be attached to such differences.

The above described peculiarities in the beak characters, dental plates and cardinalia seems to be common to all species of *Macandrevia*,* and are alone sufficient to establish the generic position of any shell. The direct evidence of the Macandrevian type of loop development is, however, forthcoming in the present species, a specimen of

* Cf. Thomson, 1916, No. 2, pp. 502–503, and the figures of *M. vanhoffeni* by Eichler (1911, Taf. XLII, fig. 9, d; Taf. XLIII, fig. 14.

6 mm. length being in the Platidiform stage. In this specimen the dental plates are already developed and there is no anterior median ridge in the ventral valve such as occurs in young stages of species of the *Magellaninae*. In the dorsal valve the elevated septum does not reach as far back as the cardinalia, and the hinge plates descend steeply from the socket ridges to the floor of the valve much as in early stages of *Terebratella rubicunda* (Thomson, 1915, No. 2). The next smallest specimen of 11 mm. length has just passed the Terebrataliform stage and shows no trace of the septum.

The dimensions of the specimen chosen as the holotype are :—length 24 mm., breadth 22 mm., thickness 11 mm. A tendency to a straight front is noticeable on specimens as small as 13 mm. in length, but the specimen of 6 mm. is regularly rounded, with a dorsal valve slightly broader than long.

Macandrevia vanhoffeni *Blochmann.*

(Plate XV, fig. 10; plate XVI, fig. 43; plate XVII, figs. 57, 58, 59.)

1906. *Macandrevia vanhoffeni* Blochmann, Zool. Anz., Bd. XXX, pp. 696–697.

1911. *Macandrevia vanhoffeni* Eichler, Deutsche Südpolar Exped., 1901–1903. Zool., Bd. IV, Heft. IV, pp. 391–392, Taf. XLII, figs. 8*a-b*, 9 *a-d*, Taf, XLIII, figs. 14, 15, 21.

Habitat.—Station 11, off Shackleton Glacier (Davis Sea), 358 fathoms, 31st January, 1914. Sea-bottom, ooze.

The single adult shell is of moderate size, white in colour, and is rather broadly ovate with rounded sides and a slightly truncate front which is gently rounded. It is not so broad as *Macandrevia lata* and differs fron that species in the narrower and rounded front. The hinge line is broad and curved without a marked angle at the dorsal umbo. The convexity is moderate, the ventral valve assuming a slightly larger share. The folding is similar to that described above for *M. lata*, except that the anterior flattening of the valves is not so pronounced. The beak characters and dental plates do not differ from those of *M. lata*, and the cardinalia are of the same pattern, but the hinge plates are more approximate at their base and there is a small swelling just in front of the dorsal umbo which seems to represent a feeble cardinal process. The loop extends to three-fifths the length of the dorsal valve. The descending branches describe gentle outward curves from the middle line, making a total width of about one-third the width of the valve. The ascending branches are missing. The shell substance is thin, and the interior has a nacreous appearance. The growth lines are fairly prominent, and there is in addition a fine but irregular radial ornament which in the interior takes the form of faintly impressed radial grooves, most noticeable at a short distance on each side of the flattened middle longitudinal part of the dorsal valve. A fine radial ornament has been described by Dall in *M. craniella*, from which the present species differs by its greater breadth and less truncate front. No such radial ornament has been described for *M. vanhoffeni*, but it is possible that it has been overlooked. It seems safest meanwhile to

ascribe the present specimen to that species, as the general shape is the same, and it was obtained from a neighbouring locality. The pore density varies from 115–120 mm. near the middle of the ventral valve, a valve differing but slightly from that observed for *M. vanhoffeni*, viz., 120–132.

The dimensions of the specimen are :—length 20 mm., breadth 17 mm., thickness 9 mm.

From the same locality there is an immature specimen of 11 mm. in length which also shows the radial grooves on one side of the interior of the dorsal valve. It is relatively broader than the adult, and is a little broader than the growth lines of the latter at the same length, but is doubtless to be referred to the same species.

Similarly a fragment of a dorsal valve, 4 mm. in length, from the same locality also shows the internal radial grooves. The loop and one side of the hinge are broken off, but there are the remains of a septum placed posteriorly but not reaching to the umbo. Obviously this fragment belongs to a young stage of the same species in the Platidiform loop stage.

Macandrevia vanhoffeni differs from *M. americana* in being slightly narrower and less convex, and also, if the present species is correctly identified, in possessing a fine radial ornament.

Habitat.—Station 10 off Shackleton Glacier (Davis Sea), 325 fathoms, 29th January, 1914. Sea-bottom, ooze. Temperature, 1·65° C.

From this locality there are four adolescent shells differing from the specimens of *M. lata* occurring at the same locality in a less amount of frontal truncation combined with a more marked radial ornament. Three of them agree nearly enough in shape with *M. vanhoffeni*, but the fourth (length 9 mm. breadth 17 mm.) is relatively nearly as broad as *M. lata*, although without the straight front of that species. It may be regarded as a broad example of the present species.

Habitat.—Station 2; lat. 66·55 S. long. 145·21 E. (off Adelie Land), 288–300 fathoms, 28th December, 1913. Sea-bottom, ooze. Temperature, 1·8° C.

From this locality there is a small specimen (length 13·5 mm., breadth 13 mm.), of broadly ovate shape with a rounded front, which also displayes the internal radial grooves in the dorsal valve. Its pore density is 103 per sq. mm. A still smaller specimen of 8 mm. in length is rather narrower and also displays the radial ornament.

Both contain dental plates, the larger being in the Macandreviform loop stage without a septum, and the smaller in what must at present (though incorrectly) be termed the Terebrataliform stage with a septum which does not unite with the cardinalia.

These specimens must be tentatively referred to as *M. vanhoffeni* in the absence of adult shells from this locality, and greatly extend the range of the species to the East.

PART II.

Geographical Distribution of the Brachiopods in the Southern Seas.

PREVIOUS DISCUSSIONS.

The geographical distribution of recent Brachiopods throughout the whole world has been stated and briefly discussed by Suess, Davidson, Oehlert, and Hall and Clarke, but at the time these discussions were attempted (1852 to 1892) many cases of discontinuous distribution, which have since proved to be cases of erroneous determinations, were believed to exist, and the conclusions reached were thus lessened in value. Many of the errors in previous determinations were corrected by Blochmann (1908), who at the same time gave a most useful statement of the significance of the general facts of distribution.

In 1892 Fischer and Oehlert gave an excellent summary of the then known distribution of the Brachiopoda of the southern seas, pointing out the unity of the faunas of the Arctic and neighbouring coasts as opposed to the diversity of the southern faunas. They grouped the latter into the following zoological provinces :— Magellan or Antarctic, New Zealand, Tasmania and Southern Australia, Cape of Good Hope, and the Kerguelen Islands. The similarities existing between the Magellan, Kerguelen, and New Zealand faunas on the one hand, and the differences from these displayed by the Australian and South African faunas on the other were sought to be explained solely by considerations of latitude and temperature.

Dall (1894) in describing *Macandrevia americana* pointed out the possibility of a migration of Brachiopods and other marine organisms along the western coast of America. " It may be observed that there is nothing to prevent the free migration of northern forms into the South Pacific along the coast of the Americas. The writer has already the evidence to show that several species in deep water do extend from Behring Sea south to the vicinity of the Galapagos Islands, and, in the case of one species, *Solemya johnsoni* Dall, more than a thousand miles further south. With the known great range of many Brachiopods, there would be no apparent reason why species of the Panamic region, for instance, belonging to the northern type of development, should not extend their range southward, if opportunity arose."

As Jackson (1912) has remarked, the prescience of this eminent American author has been amply justified by the subsequent discovery of a Panamic species of Brachiopod, *Macandrevia diamantina* Dall, off Coats' Land, Antarctic.

Von Ihering in 1903 discussed the history of the fauna of the Magellan region, and gave lists of the species from Chili, Brazil, and New Zealand. He pointed out that the Tertiary Brachiopod fauna of Patagonia agreed more closely with that of New Zealand than with that of Chili, and argued that the Patagonian and New Zealand regions were each united to an Antarctic continent at that time, but that

Patagonia was separated from Chili by a strait of considerable breadth. The present Magellan fauna was considered to consist in part of forms derived from the Tertiary fauna of that district and in part of recent immigrants from the north along the Pacific coast of America, and from the south (Kerguelen district) along the coast of the Antarctic Continent. Von Ihering recognised that the climate of the early Tertiary in Patagonia was warmer than that of the present day.

Blochmann (1908) discussed the possibilities of migration possessed by Brachiopods and their larvæ, and arrived at most interesting conclusions, which appear well founded. In the adult stage the animals are fixed to some object by their peduncle and locomotion is precluded. They are frequently swallowed by fish, and may be subsequently disgorged alive, but the chances of their living in the stomach of a fish while being carried any great distance, and the further chance of both male and female individual being thus planted close to one another, are so small as to render such a method of transference quite negligible. There remains only the distribution effected during the free swimming larval stage. In this respect a distinction must be drawn between *Lingula* and *Discina* (sensu lato) on the one hand and the rest of the class on the other.

Lingula and *Discina* have pelagic larvæ furnished with a mouth and a functioning stomach. Nevertheless only one species, the deep-sea form *Pelagodiscus atlanticus*, is cosmopolitan in its distribution. The narrower distribution of other species is probably conditioned by the fact that they are adapted to shallow bottoms in warm waters. *Discinisca lamellosa* is frequently found in great groups, which seems to show that the larvæ have not swum far, and the young of *Discinisca lævis* frequently also rest on adult shells.

So far as is known, the larvæ of other Brachiopods are not pelagic, and have not been found in the plankton of higher levels of the sea. Blochmann has himself repeatedly searched for them at the season of reproduction without success around the Norwegian coasts where Brachiopods are common, and he concludes that they remain near the bottom and settle down not far from their mother. This must especially be the case for the deeper forms which are below the effective action of currents.

The organisation of the larvæ of the species in question precludes a long duration of the free-swimming stage. With the exception of *Lingula* and *Discina** they are all, as far as known, without a mouth and functioning stomach during this stage, and must consequently soon come to rest. Actual observations on two species of *Terebratulina* show that the larvæ settle after ten to twelve days.

From these facts Blochmann concludes that the power of distribution of Brachiopods is very limited, and that the larvæ are unable to cross the oceans from one coast to another. Only a few species live in depths of over 2,000 metres (roughly

* Little is known of the larvæ of *Crania*.

1,000 fathoms) and a gradual migration across the deep oceans along the bottom is impossible for other species. The majority of the Brachiopods are found on the submarine slopes of the continents and the neighbouring islands, and the deep oceans are barriers which they cannot cross.

Cases of discontinuous distribution of the shallower water forms have therefore a profound significance. Thus the occurrence of *Dyscolia wyvillei*, *Lacazella mediterranea*, *Platidia anomioides*, and *Eucalathis ergastica* in the Antilles and on the corresponding coasts east of the Atlantic, together with the occurrence of other closely allied species on these opposite coasts and of two Antillean species on Ascension Island, can have only one explanation, viz., the occurrence of land connections or at least shallow submarine ridges across the Atlantic in an earlier geological period.

In the case of the discontinuous distribution of the deep water species *Dyscolia wyvillei* in the north Indian Ocean and east and west of the Atlantic, together with the restriction of *Chlidonophora* to these two regions, Blochmann seeks a similar geological explanation, viz., that in Tertiary times there was an open seaway between the Atlantic and the Indian Ocean through the earlier greatly extended Mediterranean Sea. The occurrence of *Kingena alcocki* Joubin in the Indian Ocean is similarly correlated with the fossil occurrence of this genus in Europe.

Before these conclusions can be regarded as definitely established, Blochmann points out that more must be learnt of the structure of the larvæ and of the duration of the free-swimming period in a larger and more varied series of genera. Meanwhile they possess a high degree of probability, and they suggest that a study of the distribution of southern Brachiopods may be a useful contribution to the larger problem of the former land connections of the southern hemisphere.

Schuchert (1911), in discussing the palæographic and geological significance of recent Brachiopoda, has analysed and discussed the bathymetric and geographical distribution of the recent genera. The districts recognised are a deep-water realm and four shallow-water geographical regions as follows :—Boreal, Austral, Oceanica, and Gondwana. The analysis contains several minor inaccuracies, but these do not greatly affect the main conclusions. A more serious defect is the apparent assumption that the origin of nearly all the southern forms must be sought in the north, but that none of the northern forms originated in the south. Yet the southern Tertiary faunas were at least as rich and varied as those of the north, and there is little reason to assume that such was not also the case in earlier times.

Schuchert follows Blochmann in postulating a former land connection across the Atlantic, the northern shore of ancient Gondwana and the southern strand of the extensive Mediterranean Tethys which reached from Central America to India. This shore was broken up in the present south Atlantic region during the early Eocene, but in the early Tertiary there was an open seaway between the Panama and Caribbean regions and also free communication with the Indian Ocean. The genera of the northern

Atlantic distributed themselves not only around the Atlantic coasts but also eastwards into the Indian Ocean, but the principal drift was westward by way of the Antillean region into the Pacific, and thence in the main down the west coast of South America into the Antarctic realm, whose waters were then much warmer than they are now.

Hemithyris is regarded as originating in the Boreal region, where the family *Rhynconellidae* is best developed since the Silurian. The four species of the Austral region seem to have spread from Japan south through Oceanica, and thence by way of New Zealand into Antarctica. This conclusion seems based mainly on the occurrence of the species *Rhynconella grayi* Woodward in the Fiji Islands, but it cannot be regarded as yet established that this species is correctly assigned to *Hemithyris*.

There are six genera restricted to the Austral region, viz., *Agulhasia*, *Kraussina*, *Bouchardia*, *Magellania*, *Terebratella* and *Megerlina*. This region is faunally connected directly with Oceanica. The other genera in these waters are regarded as immigrants from Gondwana. Schuchert has not discussed the different districts of the Austral region or the former land connections which have been suggested between them.

As regards the deep-sea realm, Schuchert concludes from a consideration of the deeper-seated forms whose geological history is known that the present deep-sea forms as a rule did not begin to migrate to this habitat earlier than the middle Mesozoic, and further, that this adaption is still going on. The truly abyssal forms, as *Basiliola*, *Chlidonophora*, *Frieleia* and *Pelagodiscus*, are probably of stocks even older than the middle Mesozoic, and these genera may have begun their abyssal march as early as the beginning of the Mesozoic, the period at which the oceans began to get exceedingly deep.

In the subsequent discussion it will be convenient first to consider the abyssal fauna, and then to state in detail the distribution of the coastal forms according to geographical districts, before discussing fully the significance of the similarities and differences that these various districts exhibit.

THE ABYSSAL FAUNA.

A distinction must be drawn, as Schuchert has pointed out, between deep-water forms which frequent the margins of the continents, and typical abyssal forms which occur in the middle parts of the great oceans as well. Of the latter there are only five species known, two of which *Chlidonophora incerta* (Dav.) and *Chlidonophora chuni* Blochmann do not occur in the southern hemisphere. *Neorhynchia strebeli* (Dall) has been reported only from the " Albatross " station, 4721, in mid-Pacific, in 2,084 fathoms, globigerina ooze, and from Station 4709 southwest of the Galapagos group, in 2,035 fathoms, ooze. The other two species, *Pelagodiscus atlanticus* (King) and *Terebratula Wyvillei* Dav., have a wide distribution in both hemispheres. The former occurs in

the north and Mid-Atlantic, off Coats Land, Antarctic, and in the Pacific Ocean at various stations around the enclosing coasts and near the middle, at depths of from 200 to 2,645 fathoms. This great geographic range is no doubt due to the pelagic life of the larvae in the free-swimming stage. *Terebratula wyvillei*, which most probably does not possess a surface-living larvae, is found at depths of from 1,035 to 2,900 fathoms off South Australia and North Queensland, in the north-west Pacific, south-west of the Galapagos Islands, off Valparaiso and the west coast of Patagonia, and near the Falkland Islands. It is thus almost restricted to the Pacific, but appears to have spread eastwards into the South Atlantic, as Blochmann observed, and westward to the Southern Ocean south of Australia. This circum-Pacific distribution is in marked contrast to the more limited range of other Pacific species inhabiting shallower waters, and helps to support Blochmann's contention that for the coastal species the deep waters form impassable barriers.

There are a number of other southern forms inhabiting depths greater than 1,000 fathoms in one or the other hemisphere, but which nevertheless are not found far away from the continental margins. Most of these occur on the Pacific coast of America, viz. :—

Liothyrina clarkeana Dall, 1,175 fathoms, Gulf of Panama, and 2,035 fathoms, south-west of the Galapagos Islands.

Macandrevia americana Dall, 1,672 fathoms, Gulf of Panama, and 122 fathoms, off the west coast of Patagonia.

Macandrevia diamantina Dall, 1,175 fathoms, Gulf of Panama, 2,222 fathoms off Peru, and 1,410 fathoms off Coats Land, Antarctica.

Waldheimia wyvillei Davidson, 2,160 fathoms off Valparaiso.

Besides *Macondrevia diamantina* and *Pelagodiscus atlanticus*, two other deep-sea forms are recorded from the Antarctic Coast, viz., *Liothyrella blochmanni* (Jackson), and *Hemithyris sp.* Jackson, 1,410 fathoms off Coats Land.

SOUTHERN GEOGRAPHICAL DISTRICTS.

The map accompanying this report is designed to throw into relief the areas of sea-bottom above 1,000 fathoms, which may be taken as the approximate depth limiting the seaward extension of the coastal species. The map is based on Stieler's Hand-atlas, which includes the results of the Valdivia and Gauss Expeditions, the map of the Antarctic published in "The Sub-Antarctic Islands of New Zealand," and the maps published by the various Antarctic expeditions including that by which the specimens here described were obtained. The Australian Antarctic Expedition made a very valuable series of soundings and has greatly modified previous views as to the contour of the sea bottom south of Australia. Very many more soundings are necessary

in all parts of the southern seas before a map claiming any great degree of accuracy can be prepared. At present it seems possible to recognise the following geographical districts of sea-bottom above the 1,000-fathom line separated from all other districts by seas of greater depth. Those from which brachiopods are known are marked with an asterisk.

*Australia including Tasmania.

*New Zealand, including Chatham, Bounty, Antipodes, Campbell, Auckland, Lord Howe, and Norfolk Islands.

Kermadec Islands.

*Macquarie Island.

Juan Fernandez and S. Felix Islands.

*South America, including the Falkland Islands.

*South Georgia.

Sandwich Islands.

Tristan da Cunha.

Gough Island.

Bouvet Island.

*South Africa.

Madagascar.

*Marion, Prince Edward, and Crozet Islands.

*Kerguelen and Heard Islands.

*St. Paul and New Amsterdam Islands.

Balleny Islands.

Peter Island.

*The Antarctic, including the South Shetland and South Orkney Islands.

Numerous other small reefs and submarine ridges.

The number of southern districts from which brachiopods have not yet been obtained is thus shown to be large, and the attention of future exploring expeditions may be directed to the desirability of obtaining dredgings in these areas. From a scientific point of view more is to be gained by an expedition exploring the little known submarine banks of the Southern and the Pacific ocean bottoms than from a further Antarctic expedition. If these banks have arisen by subsidence of previous lands, remains of coastal faunas such as brachiopods are to be expected. If, on the other hand, they represent recent diastrophic uplifts of formerly deeper portions of the ocean floor, no such faunas can occur, and they can be inhabited only by species with abyssal range or modifications of such species. There is thus a practical method of testing the theory of the permanence of ocean basins.

THE AUSTRALIAN DISTRICT.

The following species are found off the Australian and Tasmanian Coasts :—

Crania Suessi Reeve.—Off Sydney (types); Mast Head Reef, Queensland, 17–20 fathoms.

Lingula rostrum (Shaw).—Moreton Bay (cf. Hedley, 1917). Indian Ocean to Japan.

Lingula hirundo Reeve.—Port Curtis, Queensland (type).

Lingula hians Swainson.—Port Jackson (Brazier). China Seas (type).

Lingula tumidula Reeve.—Moreton Bay (Strange). Philippine Islands (type).

Lingula murphiana King.—Moreton Bay (type).

Lingula exusta Reeve.—Moreton Bay (type).

Cryptopora brazieri (Davidson).—Cabbage Tree Island, Port Stephens, N.S.W., 25 fathoms (type); Mast Head Reef, Queensland, 17–22 fathoms; east of Cape Pillar, Tasmania, 100 fathoms; off Ninety-mile Beach, Victoria, 40 fathoms.

Aetheia colurna (Hedley).—East of Wollongong, 100 fathoms (type); 3 miles east of Sydney, 250 fathoms; east of Cape Byron, N.S.W., 111 fathoms.

Terebratulina cancellata (Koch).—Western Australia (type); off South Australia, 12–200 fathoms; Bass Strait; east of Cape Pillar, Tasmania, 100 fathoms; near Port Jackson, 3–7 fathoms.

Terebratulina cavata (Verco).—Off Cape Jaffa, South Australia, 130 and 300 fathoms (type); Port Phillip Heads.

Terebratulina radula (Hedley).—East of Wollongong, 100 fathoms (type); off Narrabeen, 80 fathoms; east of Cape Pillar, Tasmania, 100 fathoms; off Wilson's Promontary, Victoria.

Terebratulina radiata Alexander (? of Reeve).—Western Australia.

Murravia exarata (Verco).—Off Cape Jaffa, South Australia, 150 fathoms (type), 49 fathoms and 40 fathoms.

Liothyrella fulva (Blochmann).—Twofold Bay, N.S.W., 600 fathoms (type); east of Cape Byron, N.S.W., 111 fathoms; 3 miles east of Schouten Island, east coast of Tasmania, 65 fathoms; off Maria Island, Tasmania, 65 fathoms.

Argyrotheca australis (Blochmann).—Cape Willoughby, Kangaroo Island, South Australia (type).

Argyrotheca mayi (Blochmann).—10 miles east of Schouten Island, Tasmaina, 50 fathoms (type).

Kraussina atkinsoni (Tenison-Woods).—Long Bay, Tasmania, 10 fathoms (type); Shoreham and San Remo, Victoria.

Megerlina lamarckiana (Davidson).—Double Bay, Port Jackson, Sydney (type); under stones at low water, Tamar Head, Tasmania (Tenison-Woods) and Williamstown, Victoria (Lucas); Frankston, Port Phillip, Portland, and Western Port, Victoria; on the beach at Robe, and at Venus Bay, South Australia (Verco).

Aldingia willemoesi (Davidson).—Twofold Bay, N.S.W., 120 fathoms (type); east of Cape Byron, N.S.W., 111 fathoms (Hedley); off Port Phillip Heads (Wilson).

Magadina cumingi (Davidson).—Type locality uncertain; Port Jackson; Bass Strait; east of Cape Pillar, Tasmania, 100 fathoms; off South Australia, 12–200 fathoms.

Magasella vercoi Blochmann.—Backstairs Passage, near Adelaide (type), 16–22 fathoms; other South Australian localities, 40–200 fathoms; Port Phillip Heads.

Campages furcifera (Hedley).—East of Cape Byron, N.S.W., 111 fathoms (type).

Campages jaffaensis (Blochmann).—Cape Jaffa, South Australia, 90 fathoms (type); north of Cape Borda, South Australia, 40 fathoms; east of Cape Pillar, Tasmania, 100 fathoms; outside Sydney, 250 fathoms; off Narrabeen, 80 fathoms.

Terebratella mayi (Blochmann).—East of Cape Pillar, Tasmania, 180 fathoms (type).

Magellania flavescens (Val.).—Type locality unknown. Port Jackson, under stones at low spring tides (Brazier), 14 fathoms; Bass Strait; in bunches, Western Port, Victoria, 6–8 fathoms; north coast of Tasmania; South Australia, 6–100 fathoms (Verco).

Frenulina sanguinolenta (Gmelin).—Port Jackson (Brazier); Mast Head Reef, Queensland, 17–20 fathoms; Bird Island, Coral Sea (Davidson).

In order to compare the Australian Fauna with that of the Pacific Islands, it is desirable to give a list of the few species known from that region.

Discinisca stella Gould.—Singapore and Philippines; also China, Japan and Korea.

Lingula rostrum (Shaw).—Philippines and Moluccas; also Indian Ocean and Japan.

Lingula tumidula Reeve.—Philippines and Australia.

Lingula reevei Davidson.—Hawaiian Islands.

Thecidellina maxilla (Hedley).—Funafuti and New Hebrides.

Rhynconella grayi Woodward.—Fiji.

Eucalathis murrayi (Davidson).—Between Kermadec Islands and Fiji, 600 fathoms.

Frenulina sanguinolenta (Gmelin).—New Caledonia, Tonga, Tahiti, Honolulu, Philippines, also Australia and Japan.

Terebratella (?) *frielei* Davidson (?).—Philippines. The type is from Halifax.

Schuchert considers that the Austral Region is closely connected faunally with Oceanica, but although the long eastern coast-line of Australia offers a favourable means of communication, the above lists do not bear out his contention. The presence of shallow water species of *Lingula* from Sydney northward certainly supports a former land connection through the Indo-Malayan Archipelago with the Philippine Islands and Eastern Asia. Similarly the presence of *Frenulina sanguinolenta*, which is also a species frequenting warm and shallow waters, suggests former land connections between North Australia and the Pacific Islands. These two elements, however, do not belong to the Southern Australian fauna developed between Sydney and South Australia, which is a typical southern fauna with peculiarities of its own, and with little if any relationship to the present fauna of Oceanica. *Crania*, *Terebratulina*, *Liothyrella*, *Terebratella*, and *Magellania*, are, as we shall presently find, genera which are widespread iu the southern seas. *Kraussina* occurs also at South Africa and *Megerlina* at the Island of St. Paul. *Cryptopora* and *Argyrotheca* are not represented elsewhere in the southern seas, but occur in the Atlantic-Mediterranean districts, and with *Kraussina* and *Megerlina* point to an old Gondwana land element which did not reach the American and Antarctic coasts, and is absent from the Pacific Islands. *Aetheia*, *Murravia*, *Magadina*, *Campages*, and *Aldingia* are not as yet known outside Australian seas, but the first three occur in the Oamaruian of New Zealand, and *Aetheia* also in the Patagonian of South America.

THE NEW ZEALAND DISTRICT.

The following species are found off the New Zealand coasts :—

Crania huttoni Thomson.—Cook Strait.

Hemithyris nigricans (Sowerby).—Foveaux Strait to Cook Strait, 19–30 fathoms, Whangaroa Harbour (Murdoch), Chatham Islands (Hutton).

Liothyrella neozelanica Thomson.—Cook Strait, 50 fathoms or more.

Liothyrella sp. Thomson.—Foveaux Strait.

Amphithyris buckmani Thomson.—Cook Strait, 50 fathoms or more.

Neothyris lenticularis (Deshayes).—Foveaux Strait, 15 fathoms; off Oamaru, 35–43 fathoms (Suter); on cable, Cook Strait, 90 fathoms (young).

Neothyris ovalis (Hutton).—Farewell Spit.

Terebratella rubicunda (Sowerby).—Foveaux Strait to Whangaroa Harbour, 5–50 fathoms; under stones at low-water, Rangitoto Island (Cheeseman); Chatham Islands; Auckland Island.

Terebratella sanguinea (Leach).—Stewart Island to Cook Strait, 5-30 fathoms; Auckland Island, 40 fathoms.

Terebratella sanguinea var. Thomson.—Off Cape Colville, 20 fathoms.

Terebratella sp., cf. *Magella carinata* Thomson.—Foveaux Strait.

The New Zealand fauna consists mainly of wide ranging southern genera with the exceptions of *Neothyris* and *Amphithyris*. The former is not known with certainty elsewhere, although some South American species have in the earlier part of this paper been compared with this genus. *Amphithyris* is a very primitive genus, presumably of considerable antiquity, found elsewhere only in the Mediterranean, and is doubtless, like the primitive Australian genera discussed above, an element derived from the ancient Gondwana coasts.

THE MACQUARIE ISLANDS DISTRICT.

The only brachiopods known from the Macquarie Islands, which are separated from New Zealand by seas of over 2,000 fathoms in depth, are the new species described above, *Magellania macquariensis* Thomson, and *Gyrothyris mawsoni* Thomson.

THE KERGUELEN DISTRICT.

The Kerguelen District includes Kerguelen, Heard, and McDonald Islands, and some smaller islets, and is separated from St. Paul and Marion Island districts by seas of over 1,000 fathoms, and from the latter by seas of over 2,000 fathoms. The following brachiopods have been described from this group :—

Hemithyris pyxidata (Davidson).—150 fathoms.

Liothyris uva Davisdon (? of Broderip).—150 fathoms.

Terebratella enspergeni Blochmann.—20–30 fathoms.

Waldheimia kerguelensis Davidson.—20–150 fathoms.

Magellania kerguelensis Eichler (? of Davidson).—10 fathoms.

This fauna is of typically southern type, with possibly a distinctive stock of the *Magellaninæ* in *Waldheimia kerguelensis* Davidson. The *Liothyris uva* will doubtless prove to be a new species of *Liothyrella*.

THE ST. PAUL ISLAND DISTRICT.

The St. Paul and Amsterdam Islands rise from a common base above the 1,000 fathom line, and are united with the Kerguelen group by a submarine ridge, which has a broad top between the 1,500 and 2,000 fathoms lines, and for the most part is less than 1,500 fathoms below the surface. The following species are known :—

Liothyrina winteri Blochmann.—371 fathoms.

Megerlina davidsoni Velain.—Abundant at low water in the interior crater.

Mergerlina occurs elsewhere only in Australia, but is closely related to the South African *Kraussinæ*. A very slight elevation of the sea bottom would connect the group above the 1,000 fathoms line with the Kerguelen group, and a greater community of fauna is perhaps to be expected. The difference in latitude, amounting to about 10 degrees, is, however, sufficient to account for the difference in the shallow water forms, even if former connections had existed.

THE MARION ISLAND DISTRICT.

The Marion Island District consists of a group of Islands all rising from an elongated east and west submarine elevation of less than 1,000 fathoms depth. It consists of Crozet, Possession, Prince Edward and Marion Islands, and is separated from the Kerguelen group by a submarine trough of more than 2,000 fathoms in depth, whereas the seas between Marion Island and South Africa are less deep than 2,000 fathoms. The distance between Crozet and Kerguelen Island is only 625 nautical miles, and between the 1,000 fathom contours there is about 450 miles. The Marion Island group has usually been included faunally with the Kerguelen group, but it seems desirable to separate them in order to call attention to the differences in their brachiopod faunas.

From the Marion Island group the following species are known :—

Terebratulina septentrionalis Davidson (? of Couthouy).—150 fathoms.

Terebratula moseleyi Davidson.—210 fathoms.

Waldheimia kerguelensis Davidson.—150 fathoms.

Platidia anomioides (Scacchi).—150 fathoms.

The occurrence of *Platidia* in this southern station is surprising, and, if confirmed, becomes of profound significance. Before the recognition of the generic distinctness of *Amphithyris* one might have said that the beak characters and shape were so distinctive that Davidson could hardly have been mistaken as to the genus. In view, however, of the fact that Davidson considered *Amphithyris seminula* a synonym of *Platidia anomioides*, the Marion Island specimens need re-examination. It is true that

the figure published by Davidson shows the typical loop of *Platidia*, but it is not explicitly stated that this specimen came from Marion Island, although the presumption is that it did.

Platidia anomioides has a very wide range, being common in shallow water in the Mediterranean, but extending into 600 fathoms in the Atlantic, where it ranges from the Shetland Islands to the south of Morocco, and on the American side from North Carolina to the Antilles. Dall has also identified specimens from the Californian Coast. It is known from the Miocene of the Vienna basin, and doubtfully from the Oligocene of Italy. It seems, then, to be a species of the ancient Tethys, which has spread west to America and through the ancient Strait of Panama to the Californian coast. If the identification of the Marion Island specimens is confirmed, it will also be necessary to conclude that it has come from the Eastern Tethys, through the Indian Ocean, down the African coasts, or has spread to the Tethys from the Gondwana region. In either case it becomes probable that the Marion Island Group has in Tertiary times been connected, above the 1,000 fathoms line at least, with South Africa. *Terebratulina* is also common to these two districts, and absent from the Kerguelen group. *Waldheimia kerguelensis*, which appears to be a shallow water species, occurs also in the Kerguelen group, but the distance is not so great that transportation in the free-swimming larval stage can be neglected in this case, although it should be noted that the prevailing currents set in the opposite direction. The absence of the South African genera, *Kraussina* and *Agulhasia*, from the Marion Island group is not a weighty argument against the former connections of these two districts, since it is easily explicable on grounds of latitude.

THE SOUTH AFRICAN DISTRICT.

No additions have been made to the brachiopod fauna of South Africa during the last thirty years, and one cannot help suspecting that numerous additions will yet be made. The following is a list of the species known to occur near the coasts :—

Terebratulina abyssicola Adams and Reeve.—Cape of Good Hope. 120 fathoms.

Terebratulina radiata Reeve.—Probably from the Cape of Good Hope.

Terebratulina septentrionalis Davidson (? of Couthouy).—Off Cape of Good Hope, 150 fathoms.

Agulhasia davidsoni King.—Agulhas Bank, 45–60 fathoms.

Terebratula vitrea var *minor* Davidson (not of Philippi).—Off Cape of Good Hope, 150 fathoms.

Kraussina rubra (Pallas).—Port Elizabeth.

Kraussina cognata (Sowerby).—Near Cape of Good Hope.

Kraussina deshayesi (Davidson).—Off Cape of Good Hope, 120 fathoms.

Kraussina pisum (Valenciennes).—Off Cape of Good Hope, 150 fathoms, near Natal.

Terebratella rubiginosa Dall.—Cape of Good Hope (?).

Of the genera represented *Agulhasia* alone is confined to this district, the only other known species being from the Cretaceous of Europe. "*Terebratula vitrea* var. *minor*" Davidson is a species not yet well known, and may be, like *Terebratulina*, either of southern or northern facies. *Terebratella* is a typically southern genus, but its occurrence in this district must be accepted with reserve. *Kraussina* is a primitive genus, probably of considerable antiquity, and its distribution in South Africa and Australia, coupled with the occurrence of its near relative *Megerlina* in St. Paul Island and Australia, probably finds an explanation in, and at the same time is an argument for, the former existence of a more or less continuous Gondwana land across the site of the Indian Ocean. Had South Africa had former land connections with the Antarctic, one would expect many southern genera amongst its fauna, since it is in the same latitude as New South Wales. As pointed out above, these may possibly yet be found with further collection.

No brachiopods are known from the Madagascar coasts, but two have been reported from Mauritius, which lies just within the Tropic Capricorn. *Terebratula cernica* Crosse was obtained from the stomach of a fish, while *Lacazella mediterranea* is stated by Sir H. Barkly to occur off Mauritius; but Davidson observes that this statement must be taken with reserve.

THE SOUTH AMERICAN DISTRICT.

The following species are known from this region :—

Discinisca lamellosa (Broderip).—Chiloe north to Gulf of Panama, 0–10 fathoms.

Discinisca laevis (Sowerby).—Concepcion, 15 fathoms. Also Peru.

Crania patagonica Dall.—West coast of Patagonia, 122 fathoms.

Terebratulina crossei Fischer and Oehlert (? of Davidson).—New Year Sound, 185 fathoms; Punta Arenas, Strait of Magellan, 10 fathoms.

Liothyrella uva (Broderip).—Gulf of Tehuantepec, South Mexico, 10–12 fathoms (type); Peru, shallow water; Strait of Magellan, 18 fathoms; Beagle Canal, 75–90 and 128 fathoms; off Tierra del Fuego, 121 fathoms; Burdwood Bank, south of W. Falkland Island, 56 and 75–90 fathoms; off east coast of Patagonia, 77 fathoms; off Buenos Ayres, 600 fathoms.

Bouchardia rosea (Mawe).—Rio Janeiro, 13 fathoms.

Magellania fontanei (d'Orbigny).—Coquimbo, Chili.

Magellania venosa (Solander).—Falkland Island (type), 6–7 fathoms; Burdwood Bank, 56 fathoms; Tierra del Fuego, Beagle Canal and Strait of Magellan, 10–79 fathoms; west coast of Patagonia, 1–33 fathoms; Coquimbo, Chili (? *M. Fontanei*).

Terebratella dorsata (Gmelin).—Falkland Islands, 9 fathoms; Burdwood Bank, 7–56 fathoms; Tierra del Fuego, Beagle Canal and Strait of Magellan, 7–120 fathoms; Bay of Valparaiso, 60–90 fathoms; Coquimbo, Chili.

Terebratella (Jackson)* vel *Magellania* (Blochmann) sp.—Burdwood Bank, 56 and 75–90 fathoms.

Macandrevia americana Dall.—West coast of Patagonia, 122 fathoms; also Gulf of Panama, 1,672 fathoms.

The deep-sea forms off the western American coast have already been listed under the Abyssal fauna. From Peru north to the Gulf of Panama, the shallow-water forms are chiefly species of *Discinisca*, besides *Liothyrella uva* as mentioned above (Dall, 1909).

Lying between South America and the Antarctic Continent there are several groups of islands—South Georgia, the Sandwich Group, and the South Orkney and South Shetland Islands—which rise from a curved submarine ridge of less than 1,500 fathoms in depth connecting the two continents, the two latter groups being separated from the Antarctic mainland by water of less than 1,000 fathoms in depth. Excluding them there is only one species known from the other groups, namely *Waldheimia smithi* Pfeffer.—South Georgia.

THE ANTARCTIC DISTRICT.

The following species are known from the Antarctic coast :—

Pelagodiscus atlanticus (King).—Off Coats Land, 1,410 fathoms (Jackson); off Kaiser Wilhelm II Land, 1,640 fathoms (Eichler, "*Discinisca* sp.").

Crania lecointei Joubin.—Off Alexander Land, 273 fathoms.

Crania joubini Thomson.—Davis Sea, 240 fathoms.

Frieleia gerlachei (Joubin).—Off Alexander Land, 273 fathoms; South of Peter Island, 246 fathoms.

Hemithyris racovitzæ (Joubin).—Off Alexander Land, 273 fathoms.

Hemithyris sp. Jackson.—Off Coats Land, 1,410 fathoms.

Hemithyris striata Thomson.—Davis Sea, 358 fathoms.

Liothyrella notorcadensis (Jackson).—South Orkneys, 6 fathoms.

Liothyrella blochmanni (Jackson).—Off Coats Land, 1,410 fathoms.

* See antea, page 17.

Liothyrella antarctica (Blochmann).—Off Kaiser Wilhelm II Land, 209 fathoms; off Adelie Land, 288–300 fathoms.

Liothyrella ovata (Thomson).—Davis Sea, 358 fathoms.

Macandrevia diamantina Dall.—Off Coats Land, 1,410 fathoms; also Gulf of Panama, 1,175 fathoms.

Macandrevia lata Thomson.—Davis Sea, 325 fathoms.

Macandrevia vanhoffeni Blochmann.—Off Kaiser Wilhelm II Land, 209 fathoms; Davis Sea, 325 and 358 fathoms; off Adelie Land, 288–300 fathoms.

Stethothyris antarctica Thomson.—Davis Sea, 358 fathoms.

Magellania joubini Blochmann.—Off Kaiser Wilhelm II Land, 209 fathoms; Davis Sea, 60 fathoms; off Adelie Land, 157 and 288–300 fathoms; Coulman Island, 100 fathoms; Ross Island, 178 fathoms; off Alexander Land, 245 and 273 fathoms.

Magellania fragilis Smith.—Agassiz Island, 300 fathoms.

Magellania vel *Terebratella* sp. Thomson.—Davis Sea, 325 fathoms.

Magellania (?) sp. Thomson.—Off Adelie Land, 288–300 fathoms.

The Antarctic fauna may be divided into cosmopolitan genera, such as *Terebratulina*, *Hemithyris*, and *Crania*, typical southern forms such as *Liothyrella*, *Stethothyris*, and *Magellania*, and recent northern immigrants such as *Macandrevia* and probably *Frieleia*.

SUMMARY OF THE DISTRIBUTION.

Excluding deep-sea forms, there are few species common to the Southern and Northern seas, and in the case of the species of *Lingula* and of *Platidia*, the identifications of the southern forms are in need of confirmation. The following is a list of the species in question :—

Lingula rostrum (Shaw).—Moreton Bay, Australia, and Indian Ocean to Japan.

Lingula hians Swainson.—Port Jackson, Australia, and China.

Lingula tumidula Reeve.—Moreton Bay, Australia, and Philippine Islands.

Platidia anomioides (Scacchi).—Marion Island, Mediterranean, North Atlantic and California.

Frenulina sanguinolenta (Gmelin).—North-east Australia and Central and North Pacific.

Only one species is common to two of the southern geographical districts, viz. *Waldheimia kerguelensis* Davidson in the Marion Island and Kerguelen groups. All the other southern species are confined to single geographical districts, and cases of discontinuous distribution, such as are known between the European and American coasts of the North Atlantic, are not found in the southern seas.

The generic distribution is shown in the following table. The most commonly occurring genera are *Crania*, *Hemithyris*, *Terebratulina*, *Liothyrella*, *Terebratella*, and *Magellania*, of which the last three only are restricted to a southern habitat. In addition to them the following less commoner genera are also peculiar to southern seas :—*Aetheia*, *Agulhasia*, *Murravia*, *Megerlina*, *Aldingia*, *Bouchardia*, *Magadina*, *Campages*, and the higher members of the *Magellaninæ*. *Kraussina* is similarly restricted except for a single species, *K. gardinera* Dall, in the Northern Indian Ocean.

	Number of Southern Districts.	Australia.	New Zealand.	Macquarie Islands.	Kerguelen Island.	St. Paul Island.	Marion Island.	South Africa.	South America.	South Georgia.	Antarctic.	Northern Hemisphere.
CRANIACEA.												
Crania	4	×	×	...	...	...	...	...	×	...	×	×
DISCINACEA.												
Discinisca	1	...	...	...	...	...	...	...	×	...	...	×
LINGULACEA.												
Lingula	1	×	...	...	...	...	...	...	...	...	...	×
RHYNCONELLACEA.												
Cryptopora	1	×	...	...	...	...	...	...	...	...	...	×
Aetheia	1	×	...	...	...	...	...	...	...	...	...	...
Hemithyris	3	...	×	...	×	...	...	...	...	...	×	×
Frieleia	1	...	...	...	...	...	...	...	...	...	×	×
TEREBRATULACEA.												
Terebratulidæ	...	...	...	...	...	...	...	...	...	...	...	...
Agulhasia	1	...	...	...	...	...	...	×	...	...	...	...
Murravia	1	×	...	...	...	...	...	...	...	...	...	...
Terebratulina	4	×	...	...	...	...	×	×	×	...	...	×
Liothyrella	5	×	×	...	..	...	...	...	×	...	×	...
"*Terebratula Liothyrina*" or "*Liothyris*"	...	...	...	...	×	×	×	×	...	...	...	...
Terebratellidæ.												
Argyrotheca	1	×	...	...	...	...	...	...	...	...	...	×
Amphithyris	1	×	...	...	...	...	...	...	...	...	...	×
Platidia	1	...	...	...	...	...	×	...	...	...	...	×
Kraussina	2	×	...	...	...	...	...	×	...	...	...	...
Megerlina	2	×	...	...	...	×	...	...	...	...	...	...
Aldingia	1	×	...	...	...	...	...	...	...	...	...	...
Bouchardia	1	...	...	...	...	...	...	...	×	...	...	...
Magadina	1	×	...	...	...	...	...	...	...	...	...	...
"*Magasella*"	1	×	...	...	...	...	...	...	...	...	...	...
Campages	1	×	...	...	...	...	...	...	...	...	...	...
Terebratella	4	×	×	...	×	...	...	?	×	...	?	...
Gyrothyris	1	...	...	×	...	...	...	...	...	...	...	...
Magellania s. str.	4	×	...	×	×	...	...	...	...	...	...	...
"*Magellania*" or "*Waldheimia*"	...	...	...	...	×	...	×	...	×	×	...	...
Neothyris	1	...	×	...	...	...	...	...	...	...	...	...
Stethothyris	1	...	...	×	...	...	...	...	...	...	...	...
Higher members of the *Magellaninæ* ...	8	×	×	×	×	...	×	?	×	×	×	...
Frenulina	1	×	...	...	...	...	...	...	...	...	...	×
Macandrevia	2	...	...	...	...	...	...	...	×	...	×	×

DISCUSSION OF THE DISTRIBUTION.

There are gaps of different kinds in our knowledge that preclude any final conclusions as to the manner in which the present distribution of southern brachiopods has been effected. The first of these is our ignorance of the fauna of large strips of the coastal seas. Schuchert considers that brachiopods have been so assiduously collected that little will be added to our knowledge of the distribution of the species. Since there are but few cases of discontinuous distribution in the southern seas, it is not probable that the range of the known species will be greatly extended, except along the coasts from which they are already known, but there is every reason to suppose that a very large number of new species will yet be found between the 100 and the 1,000 fathom line, where the dredgings are few. Fischer and Oehlert gave in 1892 a list of five species, belonging to four genera, from Bass Strait and the coast of Tasmania. From this part of the Australian coasts twelve species belonging to eleven genera are now known. Again, within the last three years the known fauna of the New Zealand coast has been more than doubled. There can be little doubt that further dredging would bring to light many new forms, especially on the West Australian, Madagascar, South African, and South American coasts. Even for the very shallow water genera, such as *Megerlina*, it is unsafe to presume that the distribution is accurately known, as there have been no systematic students of the class in Western Australia and in South Africa.

The second gap in our knowledge lies in the incompleteness of our recognition of distinct genetic stocks. Some students object to the process of minute distinctions between genera, mainly on the ground that it renders the study more complex, and a matter only for the specialist. But the narrow definition of genera, if it is based on phylogenetic grounds, prevents the assimilation of apparently similar, but historically distinct forms, and for the purpose of discussing geographical distribution and geological correlation becomes an instrument of the utmost utility. It is only necessary to specify the genus *Magellania sensu lato*, which has been fully discussed above, in illustration of this point. When all the Recent and Tertiary species of the southern hemisphere have been correctly placed genetically, it may be possible by the aid of brachiopods alone to gain a fairly accurate idea of the latest former land connections of the Southern Hemisphere.

There is a gap in our knowledge of still another kind which can hardly be remedied, and must be made the best of. That is caused by the absence of Tertiary marine rocks in South Africa and the western coast of Australia, and in that part of the Antarctic Continent facing South Africa and Australia. This absence of Tertiary rocks can only mean that these lands existed as such in Tertiary times, and then extended further seawards, since apart from probable faulting marine erosion alone must have since encroached some distance landwards. The marine beds marginal to the Tertiary lands have never become raised above sea level, else remnants of them would surely have been preserved in the present continents and islands by unequal uplift or subsequent down-faulting. The Tertiary faunas of these coasts can never become known until it is found practicable and desirable to obtain borings from the sea-bottom.

Tertiary marine faunas are known from South America (Chile, Argentine, and Patagonia), the Antarctic (islands in the Weddell Sea), New Zealand, Tasmania and south-east Australia, *i.e.*, only in the southern circum-Pacific lands. The greater part of the beds containing them belong approximately to the same age, variously estimated in the different countries and by different authors from Eocene to Miocene. Following Buckmann, I shall term it the Oligocene-Miocene. In New Zealand and South America there are also still younger faunas, which are generally referred to the Pliocene.

The following list shows the genera of which these Oligocene-Miocene faunas are composed :—

South America.—

(*a*) Chile—"Magellania," Megathyris, Discina.

(*b*) Argentine and Patagonia—Hemithyris, Aetheia, Terebratulina, Bouchardia, Pachymagas, Terebratella, "Magellania."

Antarctic.—Lingula, Hemithyris, Terebratulina, Liothyrella, Bouchardia, Magella, Pachymagas, "Magellania."

New Zealand.—Thecidellina, Aetheia, Hemithyris, Terebratulina, Murravia,* Liothyrella, Argyrotheca,* Bouchardia,* Magadina, Rhizothyris, Stethothyris, Pachymagas, Neothyris, Gyrothyris, Magella, Terebratella.

Australia.—Crania, Lacazella, Hemithyris, Terebratulina, Murravia, Liothyrella, Megerlina,* Aldingia, Magadina, Magadinella, Rhizothyris,* Stethothyris, Magella, Terebratella, Magellania.

Probably further study will show a still greater number of common genera in the above districts. Meanwhile they suffice to show the source of the most important elements of the Recent fauna. Thus the younger Tertiary (Wanganuian) fauna of New Zealand, so far as it is at present known, is a direct development of a small section only of the older Tertiary (Oamaruian) fauna, and consists only of the genera *Hemithyris*, *Terebratella* and *Neothyris*, including the majority of the Recent species of these genera in the New Zealand area. The remaining elements of the Recent fauna include one genus, *Liothyrella*, not known from the Wanganuian, but common in the Oamaruian, and only two genera not recorded fossil from the area, viz., *Crania* and *Amphithyris*. There can be little doubt that they will yet be found fossil in the Tertiary. The Recent New Zealand fauna is merely a diminished remnant of the rich Oamaruian fauna, and needs no land connections since the Miocene to explain its character. If later imgrations to and from Australia had been possible, we should expect to find, *e.g.*, *Magellania* in New Zealand and *Neothyris* in Australia. The specific and generic distinctness of the Recent New Zealand and Australian faunas precludes any land connections between the areas in the Pliocene or Post-Pliocene.

---

* Determinations hitherto unpublished. A new species of *Bouchardia* occurs in the Mount Brown beds, Canterbury, and of *Argyrotheca* in the limestone of Flat Top Hill, Oamaru, New Zealand.

Murravia catinuliformis (Tate) is found in the glauconitic limestone of Landon Creek, Oamaru, New Zealand. *Waldheimia corioensis* McCoy is a species of *Rhizothyris*. A new species of *Megerlina* is included in Mr. R. N. Atkinson's collection of fossils from Table Cape, Tasmania.

The Australian Recent fauna, leaving aside the subtropical elements on the northern parts of the east coast, must be similarly regarded as a remnant of the Miocene fauna of that area. The only genera which have not been determined fossil are *Cryptopora*, *Aetheia* (fossil in New Zealand and South America), *Argrotheca* (fossil in New Zealand), *Kraussina*, and *Campages*, most of them small forms which may easily be overlooked, As in the case of New Zealand, Pliocene or Post-Pliocene migrations from other southern areas are unnecessary from a consideration of the brachiopod fauna.

The South American Recent fauna is also in great part generically similar to the Miocene faunas of that continent, the most important exceptions being *Liothyrella*, which is unknown fossil in that area, although it is not a genus that could easily be overlooked, and *Macandrevia* which has not been recorded fossil anywhere in the southern hemisphere. Von Ihering points out also that *Magellania venosa* has no ancestral form in the Patagonian Miocene, and considers it a Recent immigrant in the Magellan district from Chile, where the related form *Magellania fontanei* occurs fossil. This appears probable enough as *Macandrevia* must certainly be considered a recent immigrant from the North Pacific, but it should be noticed that *Magellania fontanei* has since been recorded from the Antarctic Oligocene-Miocene.

The Antarctic Recent fauna is the least like the Tertiary fauna of the same district owing to the presence, on the one hand, of the recent northern immigrants *Macandrevia* and *Frieleia*, and on the other species of *Magellania* s. str., a genus apparently confined in the Miocene to Australia. The absence of this genus in New Zealand and its presence in the Macquarie Islands seems to point to a former bridge connecting Tasmania with the Antarctic through the Macquarie Islands. Too much stress must not be laid on this genus, however, for even with the narrow restriction that it has undergone it may still be polyphyletic. There is nothing to prevent any species of *Terebratella* attaining Magellaniform loop characters by simple absorption of the jugal band, and *Terebratella* s. str. had already spread to South America, New Zealand, and Australia by the Oligocene-Miocene. On the whole, then, it appears that in the districts from which Oligocene-Miocene faunas are known, the recent faunas are descendants of those fossil faunas, and the only connection which is made likely by the Recent brachiopod fauna is one between South America and the Antarctic. Even this is not definitely demanded, for the genus *Macandrevia* is one which can live below the 1,000 fathom line, and although the South American species and two of the Antarctic species have so far only been found in much shallower waters, the first mentioned, *M. americana*, also occurs in the Gulf of Panama in 1,672 fathoms, while *M. diamantina* is found at a depth of 1,410 fathoms in the Antarctic and 1,175 fathoms in the Gulf of Panama.

The elements of the southern faunas which can be definitely considered as descendants of the southern Oligocene-Miocene faunas are :—*Crania*, *Hemithyris*, *Aetheia*, *Murravia*, *Terebratulina*, *Liothyrella*, *Argyrotheca*, *Megerlina*, *Aldingia*, *Bouchardia*, *Magadina*, *Gyrothyris*, *Stethothyris*, *Neothyris*, *Terebratella* and *Magellania*. Of these

Crania, Hemithyris, Terebratulina, Liothyrella, Terebratella and *Magellania* are still widespread in the southern seas in spite of considerable diversities of climate and sea temperature.

There is abundant evidence from the associated molluscan faunas that the Patagonian of South America and the Oamaruian of New Zealand enjoyed a much warmer climate than the present, and the occurrence of brachiopod species and genera in the Oligocene-Miocene of the Antarctic, which are also found in the Patagonian and the Oamaruian and the "Miocene" of Australia, strongly suggests a warmer climate for the Antarctic seas of that date also. Tate Regan (1916) supposed from a study of the Antarctic fish that that continent was washed by cold seas probably throughout the Tertiary period, but the geological evidence all points the other way, and it is probable that the fish, like the brachiopods, have accommodated themselves to the increasing cold. The suggestion of Willis (1910) that the oceanic deep circulation may have been reversed in periods of diastrophic inactivity like the early Tertiary, and that there was a creep of warm saline equatorial water along the ocean bottom towards the poles, is worthy of serious consideration by zoologists.

Several genera occurring in the warm Oamaruian seas of New Zealand, and probably also of Australia, have apparently been able to survive the late Tertiary cooling only in the warmer Australian waters, viz., *Aetheia, Murravia, Argyotheca,* and *Magadina.* In a similar way *Bouchardia,* which once extended from Patagonia to New Zealand, is now confined to the warm seas of Brazil, while *Thecidellina* has left the southern seas altogether and now occurs only in the tropics (Funafuti, New Hebrides,and Jamaica). On the other hand *Gyrothyris* and *Stethothyris* persist only in the cooler water of Macquarie Island and the Antarctic.

The larger circum-Pacific southern districts above discussed all agree in the presence of *Crania, Liothyrella,* and of one or more of the higher genera of the *Magellaninæ.* The generic dissimilarities now existing between the faunas are of three kinds, viz. (1) dissimilarities inherited from the Oligocene-Miocene, such as the restriction of *Megerlina* and *Aldingia* to Australia, and of *Neothyris* to New Zealand; (2) dissimilarities due to unequal survival of formerly widespread genera as *e.g.,* the absence of *Hemithyris* from Australia, and of *Terebratulina* from New Zealand, and the restriction of *Aetheia* to Australia, and of *Bouchardia* to Brazil; (3) dissimilarities due to post-Miocene immigrations, such as that of *Macandrevia* to western South America and the Antarctic.

There are certain generic dissimilarities distinguishing the Recent and Tertiary faunas of New Zealand and Australia on the one hand from those of the Antarctic and South America on the other that seem to be of great significance. These consist in the absence of certain primitive genera of the *Terebratellidæ* from South America and the Antarctic, which are present in New Zealand and Australia, viz., *Argyrotheca* (fossil in New Zealand, Recent in Australia), *Amphithyris* (Recent in New Zealand), *Kraussina* (Recent in Tasmania), and *Megerlina* (fossil in Tasmania, Recent in Tasmania and

Australia). While it is still possible that these small forms will turn up in the former districts, it appears more probable that they formed an endemic element in the Oligocene-Miocene of New Zealand and Australia, and never attained a southern circum-Pacific distribution. On the other hand these genera are also found in the Indian Ocean and the Mediterranean, viz., *Argyrotheca* and *Amphithyris* in the Mediterranean, *Megerlina* at the Island of St. Paul, and *Kraussina* in South Africa and the Indian Ocean. This distribution suggests that Australia had former connections with South Africa and the Mediterranean. This probability will be greatly strengthened if the generic groupings suggested in the first part of this paper are substantiated, viz., the grouping on the one hand of the Mediterranean and Marion Island *Platidia* with *Amphithyris* and *Argyrotheca*, and on the other of the Mediterranean *Mühlfeldtia*, the Indian Ocean *Kingena*, and the Australian *Aldingia* with *Kraussina* and *Megerlina*.

Argyrotheca occurs in the Eocene of North America and in the Miocene of Europe, *Platidia* and *Mühlfeldtia* in the Miocene of Europe, and *Kingena* in the Cretaceous of Europe. All the above-mentioned genera, therefore, except *Amphithyris* and *Kraussina*, are at least as old as the Miocene, and it is probable that these two primitive genera are at least Cretaceous if not Jurassic. Except for the South African and Indian Ocean forms, which exist in districts where no fossil faunas are known, the fossil species show that the genera had attained practically their present distribution by the Miocene at least, and the connections which made this possible were probably still older.

The most obvious explanation of all the above facts is that these two groups of the *Terebratellidæ* originated on the coasts of Gondwana land, on the remnants of which they now survive, and to which they are almost restricted. *Kingena* had attained the northern coasts of the Tethys by the Cretaceous and *Argyrotheca* had crossed to America by the Eocene, while *Platidia* probably crossed about the same time. *Argyrotheca* and presumably *Amphithyris* had crossed from Australia to New Zealand by the Oligocene-Miocene. From the considerations that this Gondwana-land element did not reach the Antarctic and South America, and that the southern circum-Pacific Oligocene-Miocene fauna did not reach South Africa and Marion Island, it seems necessary to conclude that the connections between Australia and South Africa had broken down before that between Australia and the Oligocene-Miocene Pacific *via* New Zealand or New Caledonia was established, and further that before this Gondwana-land element reached New Zealand, the connections between that land and the Antarctic had been severed.

The Recent fauna of the Kerguelen Islands, consisting of *Hemithyris*, *Terebratella*, "*Magellania*" and "*Liothyris*" is a typical southern fauna of the circum-Pacific type, and is derived without doubt from an Oligocene-Miocene fauna similar to those above described. So far as the Recent Brachiopods are concerned, the group may have been isolated from all other southern lands since the close of the Miocene, and it does not appear to have retained any evidence of a Gondwana-land connection.

Excluding "*Magellania*" *kerguelensis* of the Marion Island group, which has in all probability been recently derived from the Kerguelen group, and the doubtfully localised *Terebratella rubiginosa* of the Cape, the Marion Island and South African faunas have not a typically southern fauna of the circum-Pacific type since they do not contain *Crania*, *Hemithyris*, or the higher members of the *Magellaninæ*, while the species of *Terebratulina* and "*Terebratula*" may be of southern or of northern facies. The Gondwana-land element exists in four species of *Kraussina* at the Cape, and connections with the Mediterranean are shown by the presence of *Platidia anomiodes* in Marion Island and of *Agulhasia* in South Africa. It seems safe to conclude not only that these two districts have been isolated from the rest of the southern lands since the Miocene, but that they did not share in the still earlier means of communication which permitted the southern Pacific Oligocene-Miocene fauna to attain the Kerguelen area.

The distribution of southern Recent Brachiopods, then is satisfactorily explained by an ancestral distribution in the Miocene, and not only does it not call for any land bridges or shallow submarine connections between the various southern continents and islands since that date, but is distinctly opposed to any such means of intercommunication except between South America and the Antarctic.

The generic similarities between the four southern Oligocene-Miocene faunas, on the other hand, are of such a nature as to demand at some earlier date much greater means of intercommunication between the lands bordering the South Pacific Ocean than exist at the present day. The fact that the Gondwana-land element occurs both in New Zealand and Australia, but not in the Antarctic and South America suggests that the intercommunication between New Zealand and Australia did not occur at the same time as that between New Zealand and the Antarctic, but that the latter was the earlier, or we may suppose a land barrier from New Zealand to New California separating a sea south of Australia from the Pacific Ocean and not breaking down till the Oligocene. A Tertiary fauna from New Caledonia would help materially in picturing the former connections and is likely to be found. Unfortunately little is known of the ancestral forms of the peculiarly southern Oligocene-Miocene genera, so that it is impossible in this way to form an estimate of the dates of the necessary intercommunications. So far as the genera are concerned they might have occurred as far back as the Cretaceous.

Certain specific similarities between the Oligocene-Miocene faunas, however, demand a considerably later date for the intercommunications. The following species, or perhaps more correctly nearly related forms, are common to two or more of the four districts :—

Hemithyris squamosa (Hutton).—New Zealand, Australia, and Antarctic.

Murravia catinuliformis (Tate).—Australia and New Zealand.

Terebratulina suessi (Hutton).—New Zealand and Australia.

Liothyrella tateana (Tenison-Woods).—Australia and Antarctic.

" *Magellania* " *sufflata* Tate.—Australia and New Zealand.

" *Magellania* " *fontanei* D'Orbingy.—Chili and Antarctic.

It is not probable that the intercommunications necessary for the above-stated distribution occurred in the Oligocene-Miocene, since the period was one of warm and nearly uniform conditions when climatic bars to migration were probably at a minimum, and yet the great majority of the species of that age are quite distinct in the four districts. On the other hand it is not likely that the above species are much older in origin than the Oligocene-Miocene. Their distribution was most probably effected in the late Eocene or Oligocene. Since, however, the main part of the Oligocene-Miocene faunas are generically similar but specifically distinct, it is necessary to conclude that inter-communication was possible at a still earlier date in order to allow for dispersal of the genera and subsequent specific differentiation.

By a consideration of the distribution of brachiopod faunas above, then, it seems necessary to make the following assumptions. By connections is implied not necessarily land connections but at least relatively shallow submarine ridges or chains of islands at no great distance from one another. Connections between Australia and South Africa at some date prior to the Tertiary must have existed by which the primitive genera of the *Terebratellidae* attained their present distribution in South Africa, St. Paul's Island, Marion Island, Australia, and New Zealand. The connection which permitted this Gondwana-land element to reach New Zealand was probably later. The Kerguelen district apparently did not share in this Gondwana-land connection. Connections between Australia, New Zealand, the Macquarie Islands, the Kerguelen Islands, the Antarctic and South America must have occurred in the early Tertiary, but New Zealand was not connected at the same time with Australia and the Antarctic. The connections between New Zealand, the Antarctic, and South America may have existed from an earlier date. It does not appear probable that Australia was connected directly with the Kerguelen Islands and the Antarctic during the Cretaceous or early Tertiary. The circum-Pacific southern connections were all broken much as at present by the Miocene, and since that date there have been no renewed connections between the southern continents and island districts, except possibly between South America and the Antarctic and the adjacent islands.

How far these assumptions fit in with the assumptions required by the study of the distribution of other groups of animals or plants is too large a subject to discuss in the present paper and may be left to other workers. It remains to be considered how they accord with the known geological history of the southern lands.

The views held by Hutton on the geological history of New Zealand have been considerably modified in recent years, particularly in relation to a supposed marked break between Cretaceous and Tertiary accompanied by mountain folding. Hutton recognised a major break at the close of the Jurassic, with folding of the Triassic and

Jurassic (Hokonui) sediments into an alpine range of which the present New Zealand Alps are the diminished representatives. Recent stratigraphical and physiographical studies emphasise the importance of this great post-Hokonui deformation, but demonstrate quite decisively that the majority of the present mountain ranges are due to a much later Kaikoura deformation commencing in the late Tertiary and perhaps not yet exhausted. Between these two major deformations peneplanation of the Hokonui mountains ensued, and the land was nearly all submerged in the Oamaruian (Oligocene-Miocene). Within the central part of New Zealand the Cretaceous and Tertiary beds are accordant, and any possible break between them is a disconformity and not an unconformity. There has been no mountain-forming diastrophism in New Zealand between the post-Hokonui and Kaikoura deformations. In one part or another of the area now New Zealand there was practically continuous deposition between these two major epochs of diastrophism, resulting in a series of beds from Middle Cretaceous to probably Upper Pliocene, which in their totality I have termed the Notocene (Thomson, 1917, No. 2.). In the middle of the Oamaruian the sea transgressed on both the east and the west coasts of both islands so that the land was at a minimum, and during this period any connections with Australia are most improbable. The Cretaceous transgressions, however, affected only the eastern coasts except in the north of Auckland, and during this period the land may have extended far to the west and north-west, and may have continued to do so during the Eocene.

Diastrophic considerations in distant correlation have not yet been fully appraised, but their value in the form advocated by Willis (1910), in which distinct dynamic districts bordering the different oceans are recognised, seems to be considerable. No geological facts known to me controvert the probability that the diastrophic history of the New Zealand area in its major outlines is also that of eastern Australia and western America, both North and South, in fact of the circum-Pacific lands.* According to this view, the late Jurassic or early Cretaceous was a period of major diastrophism with emergent lands around the Pacific, coupled with diversities of climate similar to those of the present. Base-levelling and rise of the strand-line, the latter modified by local warpings, and perhaps intermittent owing to the different diastrophic history of other connecting oceans, followed throughout the Cretaceous and Eocene, and attained its climax in the Oligocene-Miocene, when the continents were low-lying and peneplained, and their margins largely overflowed by the ocean. At the same time the climate, which in the New Zealand Senonian had well-contrasted seasons (Stopes, 1914), had altered to become more uniform and mild. With the early stages of the Kaikoura deformation the land areas were again increased, and the climate became diversified, the climate of the New Zealand Wanganuian not being greatly different from that of the present day. With the full attainment of the

* Since the above was written, A. Windhousen (Am. Journ. Sci., ser. 4, vol. xlv, pp.1-53, 1918) has discussed the problem of the Cretaceous-Tertiary boundary in South America, and concludes that both in Chile and Patagonia there is a hiatus between Cretaceous and Tertiary sediments, corresponding to the first phase of the Andine orogenetic movements. The latter, therefore, seem to be earlier in inception that the Kaikoura deformation. Nevertheless, the transgressions in Patagonia increase in area from the Cretaceous to the Oligocene-Miocene, as in New Zealand, and the diastrophic history of the two areas is broadly parallel.

Kaikoura deformations New Zealand and Australia passed through glacial climates, not very pronounced but with a much greater development of glaciers than exists at the present day.

If this view of the geological history of the circum-Pacific lands is sustained, former land connections between them are most to be expected in the late Jurassic or early Cretaceous and in the late Pliocene and post-Tertiary, but not in the Oligocene-Miocene. The distribution of the land faunas and floras negatives any land connections by means of the Kaikoura deformations, and with this the specific distinctness of the coastal brachiopod faunas stands in agreement. The former connections that are demanded by the distribution of the brachiopods as well as of land animals must have been due to the post-Hokonui deformation.

According to the diastrophic theory, periods of climacteric diastrophism are periods of climatic diversity and provincial faunas with restrictional evolution, while the period of early base-levelling is a period of rapidly-expanding and competing faunas, giving rise to cosmopolitan faunas at the period of climacteric base-levelling.

Unfortunately little is known of the brachiopods of southern lands in the Cretaceous and Eocene. The cosmopolitan faunas of the period of climacteric base-levelling and maximum sea transgression, the Oligocene-Miocene, fail because by this time the southern rim of the Pacific had broken down Only a very few species attain a cosmopolitan distribution, and the presence of these demands that the connections remained effective almost till the Oligocene-Miocene.

LIST OF PAPERS CONSULTED.

The following list includes the papers cited in the text, and other papers recording the distribution of Southern Brachiopods. An effort has been made to render it a complete bibliography of papers on southern Brachiopods published since Davidson's Monograph of the Recent Brachiopoda. Mr. C. Hedley has kindly supplied some references which I had over-looked.

Alexander, W. B. (1914).—A Brachiopod new to Australian Waters. Rec. West. Austral. Mus., vol. I, pp. 239–240.

Beecher, C. E. (1895).—Revision of the Families of Loop-bearing Brachiopoda. The development of *Terebratalia obsoleta* Dall. Trans. Conn. Acad., vol. IX, pp. 376–399, Plates I–III.

„ (1897).—Morphology of the Brachia. Chap. IV in Schuchert, C. A Synopsis of American Fossil Brachiopoda including Bibliography and Synonymy. Bull. U.S. Geol. Surv., No. 87, pp. 105–112.

Bemmelen, J. F. van. (1882).—Over den Bouw der Schelpen von Brachiopoden en Chitonen. Inaug. Dissert. Leiden.

„ (1882).—Untersuchungen über den anatomischen und histologischen Bau der Brachiopoda Testicardinia. Jenaische Zeitschr. f. Naturw. Bd. XVI, pp. 88–150. (Ref. to pp. 117–118.)

Blochmann, F. (1906).—Neue Brachiopoden der Valdivia- und Gauss-expedition. Zool. Anz., Bd. XXX, pp. 690–702, figs. 1–3.

„ (1908).—Zur Systematik und Geographischen Verbreitung der Brachiopoden. Zeitschr. f. wissensch. Zool., Bd. XC, pp. 596–644, Taf. XXXVI–XL.

„ (1910).—In Verco, J. C. The Brachiopods of South Australia. Trans. Roy. Soc. S. Austral., vol. XXXIV, pp. 89–99, plates XXVII and XXVIII.

„ (1912).—Die Brachiopoden der Schwedischen Südpolar-Expedition. Wissensch. Ergebn. Schwed. Südpolar-Exped. 1901–1903, Bd. VI, Lief. 7, 12 pp., III Taf.

„ (1914).—Some Australian Brachiopods. Papers and Proc. Roy. Soc. Tasmania (1913), pp. 112–115, plates X–XII.

Brazier, J. (1880).—List of the Brachiopoda or Lamp Shells found in Port Jackson, and on the coast of New South Wales. Proc. Linn. Soc. N.S.W., vol. IV, pp. 399–403.

Brazier, J. (1889).—Notes and Critical Remarks on a donation of shells sent to the Museum of the Conchological Society of Great Britain and Ireland. Journ. of Conch., vol. VI, No. 1, pp. 66–84 (Ref. to p. 82).

Buckmann, S. S. (1910).—Antarctic Fossil Brachiopoda collected by the Swedish South Polar Expedition. Wissensch. Ergebn. Schwed. Südpolar-Exped. 1901–1903, Bd. III, Lief. 7, 43 pp. III plate.

„ (1916).—Terminology for Foraminal Development in Terebratuloids (Brachiopoda). Trans. N.Z. Inst., vol. XLVIII, pp. 130–132.

Cheeseman, T. F. (1887).—On the Mollusca of the Vicinity of Auckland. Trans. N.Z. Inst., vol. XIX, pp. 161–176 (Ref. to p. 176).

Dall, W. H. (1871).—Report on the Brachiopoda obtained by the United States with a Revision of the Craniidæ and Discinidæ. Bull. Mus. Comp. Zool. Harvard, vol. III, No. 1, pp. 1–45, plates I and II.

„ (1895).—Scientific Results of Explorations by the U.S. Fish Commission Steamer "Albatross." No. XXXIV. Report on Mollusca and Brachiopoda dredged in deep water, chiefly near the Hawaiian Islands, with illustrations of hitherto unfigured species from north-west America. Proc. U.S. Nat. Mus., vol. 17, pp. 675–733, plates XXII–XXXII (Brachiopods pp. 713–729).

„ (1908).—Reports on the Dredging Operations off the West Coast of Central America to the Galapagos, to the West Coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U.S. Fish Commission Steamer "Albatross," during 1891, Lieut. Commander Z. L. Tanner, U.S.N., Commanding, XXXVIII.

Reports on the Scientific Results of the Expedition to the Eastern Tropical Pacific, in charge of Alexander Agassiz, by the U.S. Fish Commission Steamer "Albatross," from October, 1904, to March, 1905, Lieut. Commander L. M. Garrett, U.S.N., Commanding, XIV.

Reports on the Mollusca and Brachiopoda. Bull. Mus. Comp. Zool., Harvard Coll., vol. XLIII, No. 6, pp. 205–487, plates 1–19 (Ref. to pp. 205–212, 439–445).

„ (1909).—Report on a Collection of Shells from Peru, with a Summary of the Littoral Marine Mollusca of the Peruvian Zoological Province. Proc. U.S. Nat. Mus., vol. 37, pp. 147–294 (Ref. to pp. 182, 278–9).

DAVIDSON, T. (1880).—Report on the Brachiopoda dredged by H.M.S. "Challenger," during the years 1873–1876. Voy. "Challenger," Zool., vol. 1, 67 pp., 4 plates.

„ (1886–88).—A Monograph of Recent Brachiopoda. Parts I, II, III, Trans. Linn. Soc. Zool., vol. IV, parts I, II, III, pp. 1–248, plates I–XXX.

DESLONGCHAMPS, E. E. (1860).—Sur la fonction des spicules calcaires renfermés dans le manteau de certaines Brachiopoos. L'Institut, XXVIII, pp. 421–422.

„ (1865).—Recherches sur l'organisation du manteau chez les Brachiopodes articulés et principalement sur les spicules calcaires contenus dans son intérieur. Mém. Soc. Linn. Normandie, XIV, No. 2.

„ (1884).—Notes sur les modifications à apporter à la classification des Terebratulidæ. Bull. Soc. Linn. Normandie, ser. 2, vol. 8, pp. 161–297, plates I–VIII.

EICHLER, P. (1911).—Die Brachiopoden. Deutsche Südpolar-Exped. 1901–1903, Bd. XII (Zool. Bd. IV), Heft IV, pp. 383–401, Taf. XLII–XLIV.

FISCHER, P. AND OEHLERT, D. P. (1891).—Brachiopodes. Expéd. scient. du Travailleur et du Talisman. Paris. 139 pp., 8 plates.

„ (1892).—Mission scientifique de Cap Horn (1882–83). Brachiopodes. Bull. Soc. Hist. d'Autun, t. 5, pp.254–334, plates VIII–XIII.

GATLIFF, J. H. AND GABRIEL, C. L. (1914).—List of Recent Victorian Brachiopoda. Victorian Nat., vol. 30, pp. 210–214, plate XI.

GOULD, A. A. (1882).—Mollusca and Shells. United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842. Under the command of Charles Wilkes, *U.S.N.*, vol. XII (Ref. to pp. 465–469).

HEDLEY, C. (1904.—Studies in Australian Mollusca. Part VIII. Proc. Linn. Soc. N.S.W., vol. XXIX, pp. 182–211, plates VIII–X (Ref. to pp. 209–210).

„ (1905).—Mollusca from 111 fathoms east of Cape Byron, N.S.W. Rec. Austral. Mus., vol. 6, pp. 41–54 (Ref. to p. 43).

„ (1906).—The Mollusca of Mast Head Reef, Capricorn Group, Queensland. Proc. Linn. Soc., N.S.W., vol. XXXI, pp. 453–479, plates XXXVI–XXXVIII (Ref. to pp. 463–467).

„ (1907).—The Results of Deep-sea Investigation in the Tasman Sea. 3—Mollusca from 80 fathoms off Narrabeen, Sydney, N.S.W. Rec. Austral. Mus., vol. 6, pp. 283–304, plates LIV–LVI (Ref. to pp. 286–288).

HEDLEY, C. (1909).—The Marine Fauna of Queensland. Rep. Austral. Ass. Adv. Sci., XII, Meeting, Brisbane, 1909, pp. 329–371 (Ref. to p. 371).

„ (1911).—Report on the Mollusca. Commonwealth of Australia Dept. of Trade and Customs. Fisheries. Zool. Result of the Fishing Experiments carried out by the F.I.S. "Endeavour," 1907–10. (H. C. Dannevig, Commonwealth Director of Fisheries). Part I, pp. 90–114, plates XVII–XX (Ref. to p. 114).

„ (1916).—A preliminary index of the Mollusca of Western Australia. Journ. Roy. Soc., W.A., vol. I, pp. 152–226 (Ref. to p. 223).

„ (1917).—Studies on Australian Mollusca. Part XIII. Proc. Linn. Soc. N.S.W., vol. XLI, pp. 680–719 (Ref. to pp. 694–695).

IHERING, H. von. (1903).—Les Brachiopodes Tertiares de Patagonie. Anal. Museo Nac. Buenos Aires, Tomo IX. (Ser. 3a, t. 11), pp. 321–349.

JACKSON, J. W. (1912).—The Brachiopoda of the Scottish National Antarctic Expedition. Trans. Roy. Soc. Edin., vol. XLVIII, part II, No. 19, pp. 367–390, plates I and II.

JOUBIN, L. (1901).—Brachiopodes. Expéd. Antarctique Belge. Rapports Scientifiques. Anvers. 12 pp. 2 plates.

LODDER, M. (1900).—List of the Tasmanian Shells in the Tasmanian Museum collection, with the names of many species that are not yet represented therein. Proc. Roy. Soc. Tasmania (1898–1899), pp. 129–147 (Ref. to p. 147).

LUCAS, A. H. S. (1890).—On the occurrence of Kraussina lamarckiana Davidson at Williamstown, with a census of the Victorian Brachiopoda. Proc. Roy. Soc. Vict., vol. II (n.s.) pp. 48–49.

MARTENS, E. AND PFEFFER, G. (1887). —Die Mollusken von Süd-Georgien nach der Ausbeute der Deutschen Station, 1882–1883. Jahrb. d. wissensch. Anstalt. zu Hamburg, Bd. III, pp. 63–135, 4 plates (Ref. to pp. 130–132, plate IV, fig. 16).

MARTENS, E. von. (1889).—Forschungreise Gazette, iii, p. 283.

MURDOCH, R. (1905).—Additions to the Marine Mollusca of New Zealand. Trans. N.Z. Inst., vol. XXXVII, pp. 217–232 (Ref. to p. 232).

MURRAY, J. (1897).—On the Deep and Shallow water Marine Fauna of the Kerguelen Region of the Great Southern Ocean. Trans. Roy. Soc. Edin., vol. XXXVIII, pp. 343–500 and map.

OEHLERT, D. P. (1906).—Note sur les Brachiopodes recueillés au cours de l'expédition antarctique française commandée par le Dr. J. Charcot. Bull. Museum Paris, pp. 555–557, figs. 1, 2.

„ (1908).—Brachiopodes. Expéd. Antarctique Française (1903–1905), Paris, 2 pp. 1 plate.

Percival, F. G. (1916).—On the Punctation of the Shells of Terebratula. Geol. Mag., dec. VI, vol. III, pp. 51–56, plate III.

Petterd, W. F. (1879).—Critical Remarks on the Rev. J. E. Tenison-Wood's "Census of Tasmanian Shells." Journ. of Conch., ii, 1879, p. 354.

Pritchard, G. B. (1896).—A Revision of the Fossil Fauna of the Table Cape beds, Tasmania, with descriptions of the new species. Proc. Roy. Soc. Vict. n.s., XII, pp. 141–143.

Regan, G. Tate (1914).—Fishes. British Antarctic ("Terra Nova") Expedition, 1910, Zool. vol. I, No. 1, pp. 1–54 (Ref. to p. 40).

Schuchert, C. (1911).—Palæographic and Geologic Significance of Recent Brachiopoda. Bull. Geol. Soc. Am., vol. 22, pp. 258–275.

Shirley, J. (1911).—Additions to the Marine Mollusca of Queensland. Proc. Roy. Soc. Queensland, XXIII, p. 102.

Smith, E. A. (1879).—An account of the Petrological, Botanical and Zoological Collections made in Kerguelen's Land and Rodriguez during the Transit of Venus Expeditions carried out by order of Her Majesty's Government in the years 1874–75. Zoology, Brachiopoda. Phil. Trans. Roy. Soc., vol. 168 (extra volume) p. 192.

,, (1888).—Account of the Zoological Collections made during the survey of H.M.S. "Albert," in the Straits of Magellan, and on the coast of Patagonia. IV. Mollusca and Molluscoida. Proc. Zool. Soc., pp. 22–44, plates III–V. (Ref. to p. 44).

,, (1907).—National Antarctic Expedition ("Discovery"), 1901–1904. Zool., vol. II, Brachiopoda, 2 pp.

Sowerby, G. B. (1892).—Marine Shells of South Africa, a catalogue of all the known species with references to figures on various works, descriptions of new species, and figures of such as are new, little known, or hitherto unfigured; pp. 1–89, plates 1–5 (Ref. to p. 67 and appendix (1897), p. 28).

Stopes, M. C. (1914).—A new Araucarioxylon from New Zealand. Ann Bot. vol. XXVIII, No. CX, pp. 341–350 (Ref. to pp. 348–349).

Suter, H. (1911).—Scientific Results of the New Zealand Government Trawling Expedition, 1907. Mollusca, Part II. Rec. Cant. Mus. (Christchurch, N.Z.), vol. 1, No. 3, pp. 273–284 (Ref. to p. 284).

,, (1913).—Manual of the New Zealand Mollusca. Wellington, N.Z. (Ref. to pp. 1074–76).

Tapparone-Canefri (1873).—Zool. Magenta, p. 255.

TATE, R. (1891).—Unrecorded Genera of the Older Tertiary Fauna of Australia, including Diagnoses of some New Genera and Species. Journ. Roy. Soc. N.S.W., vol. XXVII, pp. 167–197, plates X–XIII, (Ref. to *Crania quadrangularis*, p. 191, plate XI, fig. 12, 12a.)

,, (1899).—A revision of the Older Tertiary Mollusca of Australia, Trans. Roy. Soc., S.A. XXIII, pp. 250–259.

TATE, R. AND MAY, W. L. (1901).—Census of the Marine Mollusca of Tasmania, Proc. Linn. Soc. N.S. Wales, XXVI, pp. 344–471, plates XXIII–XXVII (Ref. to p. 442).

TENISON-WOODS, J. C. (1878).—Census; with Brief Descriptions of the Marine Shells of Tasmania and the Adjacent Islands. Proc. Roy. Soc. Tasm. for 1877, pp. 26–57 (Ref. to p. 57.).

THOMSON, J. A. (1915—1).—Brachiopod Genera : the Position of Shells with Magaselliform Loops, and of Shells with Bouchardiform Beak Characters. Trans. N.Z. Inst., vol. XLVII, pp. 392–403.

,, (1915—2).—Additions to the Knowledge of the Recent Brachiopoda of New Zealand. Trans. N.Z. Inst., vol. XLVII, pp. 404–409.

,, (1915—3).—The Genera of Recent and Tertiary Rhynconellids. Geol. Mag. Dec. VI, vol. II, pp. 387–392.

,, (1916—1).—Additions to the Knowledge of the Recent and Tertiary Brachiopoda of New Zealand and Australia. Trans. N.Z. Inst., vol. XLVIII, pp. 41–47.

,, (1916—2).—The Classification of the Terebratellidæ. Geol. Mag. Dec. VI, vol. III, pp. 496–505.

,, (1917).—Diastrophic and other Considerations in Classification and Correlation, and the Existence of Minor Diastrophic Districts in the Notocene. Trans. N.Z. Inst., vol. XLIX, pp. 397-413.

TWELVETREES, W. H. AND PETTERD, W. F. (1900).—On the genus Kraussina in Tasmania. Proc. Roy. Soc. Tasmania (1898–1899), pp. 88–91, figs. 1, 2, 3.

VERCO, J. C. (1910).—The Brachiopods of South Australia. Trans. Roy. Soc. S. Austral., vol. XXXIV, pp. 89–99, plates XXVII–XXVIII.

WHITELEGGE, T. (1889).—List of the Marine and Fresh-water Invertebrate Fauna of Port Jackson and the neighbourhood. Journ. Roy. Soc. N.S.W., vol. 23, pp. 163–323 (Reference to pp. 293–294).

WILLIS, B. (1910).—The Principles of Paleogeography. Science, ns., vol. XXXI, pp. 241–260.

WILSON, J. B. (1887).—List of Gastropoda, Lamellibranchiata, and Brachiopoda obtained at or near Port Phillip Heads. Victorian Naturalist, vol. 4, No. 2, pp. 116–118.

EXPLANATION OF PLATES.

Plate XV.

Fig.

1, 2, 3, 4, 5.—*Gyrothyris mawsoni* Thomson. One mile off south end of Macquarie Island. Holotype. Enlarged $1\frac{1}{2}$ diameters.

6, 7.—*Magellania joubini* Blochmann. Station 8, Davis Sea, 60 fathoms. Enlarged $1\frac{1}{2}$ diameters.

8, 9.—*Liothyrella antarctica* (Blochmann). Station 2, off Adelie Land, 288-300 fathoms. Enlarged $1\frac{1}{2}$ diameters.

10.—*Macandrevia vanhöffeni* Blochmann. Station 11, off Shackleton Glacier, 358 fathoms. Dorsal valve, ventral view; the same specimen as figs. 57-59, plate III. Enlarged $1\frac{1}{2}$ diameters.

11, 12.—*Terebratella vel Magellania* sp. Station 10, off Shackleton Glacier, 325 fathoms. Enlarged $1\frac{1}{2}$ diameters.

13, 14, 15, 16, 17.—*Magellania macquariensis* Thomson. Beach, Wireless Cove, Macquarie Island. Figs. 13, 14, holotype; fig. 15, paratype, showing greater elongation and a straightened front; figs. 16, 17, interior views of paratype.

18, 19.—*Crania joubini* Thomson. Station 9, Davis Sea, 240 fathoms. Holotype (dorsal valve). Fig. 18 is a dorsal or exterior view, and fig. 19 a ventral or interior view. Enlarged about $3\frac{1}{2}$ diameters.

20, 21, 22.—*Liothyrella fulva* (Blochmann). Off Maria Island, Tasmania, 65 fathoms. Figs. 20 and 21 show the interior of the valves with the dried animal, and particularly the course of the sinuses of the mantle, which are white owing to the presence of spicules; fig. 20 shows the interior of the dorsal valve after the removal of the animal. Natural size.

23.—*Magellania* (?) sp. Station 2, off Adelie Land, 288-300 fathoms. Enlarged about $2\frac{1}{2}$ diameters.

24, 25, 26.—*Stethothyris antarctica* Thomson. Station 10, off Shackleton Glacier, 325 fathoms. Holotype. Natural size.

27, 28.—*Stethothyris uttleyi* Thomson. Ototaran, Weston, New Zealand. Anterior portions of dorsal and ventral valves of paratypes. Natural size.

29.—*Amphithyris buckmani* Thomson. Cook Strait, near Wellington, New Zealand. Dorsal valve of holotype with the animal, mounted in balsam, viewed ventrally by transmitted light. Enlarged about 15 diameters.

Plate XVI.

Fig.

30, 31, 32.—*Hemithyris striata* Thomson. Station 11, off Shackleton Glacier, 358 fathoms. Holotype. Enlarged 1⅓ diameters.

33, 34.—*Magellania joubini* Blochmann. Station 3, off Adelie Land, 157 fathoms. Natural size.

35.—*Amphithyris buckmani* Thomson. Cook Strait, near Wellington, New Zealand. Holotype, ventral valve, ventral view. Enlarged about 3½ diameters.

36, 37, 38.—*Liothyrella neozelanica* Thomson. Cook Strait, near Wellington, New Zealand. Figs. 36, 37, holotype; fig. 38, dorsal valve of paratype, ventral view showing part of body wall and mantle adhering to the shell. Natural size.

39.—*Stethothyris antarctica* Thomson. Station 10, off Shackleton Glacier, 358 fathoms. Pores and mosaic of interior ventral valve of holotype, near the left margin. Enlarged 100 diameters.

40.—*Magellania macquariensis* Thomson. Beach, Wireless Cove, Macquarie Island. Pores and mosaic of interior of ventral valve of paratype, a little in front of the middle. Enlarged 100 diameters

41.—*Magellania joubini* Blochmann. Pores and mosaic of the interior of the ventral valve of the specimen shown in fig. 34, plate XVI, a little in front of the middle. Enlarged 100 diameters.

42.—*Liothyrella ovata* Thomson. Station 10, off Shackleton Glacier, 325 fathoms. Pores and mosaic of interior of ventral valve of holotype, a little in front of the middle. Enlarged 100 diameters.

43.—*Macandrevia vanhöffeni* Blochmann. Station 11, off Shackleton Glacier, 358 fathoms. Pores and mosaic of interior of ventral valve, a little in front of the middle. Enlarged 100 diameters.

44.—*Macandrevia lata* Thomson. Station 10, off Shackleton Glacier, 325 fathoms. Pores and mosaic of interior of ventral valve of paratype, a little in front of the middle. Enlarged 100 diameters.

45.—*Hemithyris striata* Thomson. Station 11, off Shackleton Glacier, 358 fathoms. Mosaic of interior of ventral valve.

Plate XVII.

Fig.

46, 47, 48, 49, 50.—*Macandrevia lata* Thomson. Station 10, off Shackleton Glacier, 325 fathoms. Figs. 46, 47 holotype; fig. 48, posterior view of portion of the ventral valve of an old shell, showing the position of the foramen; fig. 49, dorsal-anterior view of the same specimen, showing the dental plates united by a deposit of callus; fig. 50, interior of dorsal valve of another paratype. Enlarged 1½ diameters.

51, 52.—*Liothyrella neozelanica* Thomson. Cook Strait, off Wellington, New Zealand. Fig. 51, spicules of dorsal body wall of the holotype, near the middle; fig. 52, spicules of the ventral body wall, on the side. Enlarged 45 diameters.

53.—*Liothyrella fulva* (Blochmann). Off Maria Island, Tasmania, 65 fathoms. Spicules of the ventral body wall, near the middle. Enlarged 45 diameters.

54, 55, 56.—*Liothyrella ovata* Thomson. Station 10, off Shackleton Glacier, 325 fathoms. Holotype. Fig. 56 shows the left part of fig. 55, differently lighted to bring out the radial ornament. Enlarged 1½ diameters.

57, 58, 59.—*Macandrevia vanhöffeni* Blochmann. Station 11, off Shackleton Glacier, 358 fathoms. Fig. 59 is an anterior view of the specimen shown in figs. 57 and 58, with the valves gaping as far as the articulation will allow. Enlarged 1½ diameters.

60.—*Stethothyris pectoralis* (Tate). Miocene, Aldinga, South Australia, after a specimen in the Dominion Museum. Anterior portion of dorsal valve, ventral view. Slightly enlarged.

Plate XVIII.

Fig.

61, 62.—*Liothyrella neozelanica* Thomson. Cook Strait, off Wellington, New Zealand. Spicules of dorsal body wall of holotype at the side. Fig. 61, enlarged 30 diameters; fig. 62, enlarged 45 diameters.

63.—*Liothyrella ovata* Thomson. Station 10, off Shackleton Glacier, 325 fathoms. Spicules of right arm of the holotype, near the proximal end. Enlarged 45 diameters.

64.—*Liothyrella neozelanica* Thomson. Spicules of dorsal side of right arm of the holotype, near the distal end. Enlarged 45 diameters.

65, 66.—*Liothyrella antarctica* (Blochmann). Station 2, off Adelie Land, 288-300 fathoms. Fig. 65, spicules of left arm of the specimen figured in fig. 8, plate XV., near the proximal end. The spicules in focus are those of the dorsal side. Those underneath them and not in focus are the main plates of the ventral side. Fig. 66, spicules of the arms of a young specimen of 6 mm. dorsal view. Enlarged 45 diameters.

INDEX.*

PAGE

abyssicola, Terebratulina 48
Aetheia 12, 43, 45, 52, 54–56
affinis Liothyrina 13, 16
Agulhasia 40, 48, 49, 52, 58
alcocki Kingena 39
Aldingia 7, 44, 45, 52, 54–57
americana Macandrevia 33, 34, 36, 37, 41, 50, 55
Amphithyris **20–23,** 45–47, 52, 54, 56, 57
anomala Crania 10
Anomia 10, 11
anomioides Platidia 21, 39, 47, 48, 51, 58
antarctica Hemithyris 12
antarctica Liothyrella 13, **16–17,** 51
antarctica Liothyrina 13, 16
antarctica Stethothyris 25, **27–28,** 51
arctica Liothyrina 13, 16
Argyrotheca 6, 7, 20, 21, 43, 45, 52, 54–57
atkinsoni Kraussina 44
atlanticus Pelagodiscus 38, 40, 50
australis Argyrotheca 21, 43

Basiliola 40
biplicata Terebratula 9
blochmanni Liothyrella 13, 16, 50
Bouchardia 40, 49, 52, 54–56
brazieri Cryptopora 43
buckmani Amphithyris 20, **22–23,** 45

Campages 29, 44, 45, 52, 55
campbellica Neothyris 25
cancellata Terebratulina 43
carinata Magella 24
catinuliformis Murravia 54, 58
cavata Terebratulina 43
cernica Terebratula 49
Chlidonophora 6, 7, 39, 40
chuni Chlidonophora 40
Cincta 11, 12, 33
Cistella 21
clarkeana Liothyrina 13, 41

* The numbers in thicker type indicate the pages where the descriptions occur.

PAGE

cognata KRAUSSINA 48
colurnus HEMITHYRIS 12
colurna AETHEIA 42, 43
concentrica LIOTHYRELLA 13
corioensis RHIZOTHYRIS 54
corioensis WALDHEIMIA 54
cornea RHYNCONELLA 11, 12
craneana HEMITHYRIS 11
CRANIA **10**, 38, 45, 49–52, 54–56, 58
CRANIACEA **10**, 52
craniella MACANDREVIA 34, 35
craniolaris ANOMIA 10
cranium MACANDREVIA 34
cranium TEREBRATULA 33
crossei TEREBRATULA 49
cruenta TEREBRATULA 31
CRYPTOPORA 45, 52, 55
cumingi MAGADINA 44

DALLININÆ 7, 20, 21, **33–36**
davidsoni AGULHASIA 48
davidsoni LIOTHYRINA 13
davidsoni MEGERLINA 47
deshayesi KRAUSSINA 48
diamantina MACANDREVIA 34, 37, 41, 51, 55
DISCINA 38, 54
DISCINACEA 52
DISCINISCA 38, 44, 49, 50, 52
DISCULINA 7
doederleini HEMITHYRIS 12
dorsata ANOMIA 31
dorsata TEREBRATELLA 9, 24, 50
DYSCOLIA 7, 39

echinata MÜHLFELDTIA 21
enspergeni TEREBRATELLA 46
ergastica EUCALATHIS 39
EUCALATHIS 6, 7, 39, 45
evansii TEREBRATELLA 31
exarata MURRAVIA 43
exusta LINGULA 43

flavescens MAGELLANIA 26, 31
flavescens TEREBRATULA 28
fontanei MAGELLANIA 26, 44, 49, 55, 59
fontanei TEREBRATULA 26
fragilis MAGELLANIA 26, 32, 51

PAGE

FRENULINA 44, 45, 51, 52
frielei TEREBRATELLA 45
FRIELEIA 11, 12, 40, 50–52, 55
fulva LIOTHYRELLA **13–14,** 16, 19, 43
fulva LIOTHYRINA 14
furcifera CAMPAGES 44

gardineri KRAUSSINA 52
gerlachei FRIELEIA 12, 50
gerlachei RHYNCONELLA 11, 12
gravida LIOTHYRELLA 19
grayi RHYNCONELLA 40, 44
GYROTHYRIS **23,** 24, **28,** 46, 52, 54–56

halli FRIELEIA 11, 12
HEMITHYRIS 11–12, 40, 45, 46, 50–52, 54–58
hians LINGULA 43, 51
hirundo LINGULA 43
huttoni CRANIA 10, 45

incerta CHLIDONOPHORA 40
incerta MAGASELLA 21
incerta PLATIDIA 21

jaffaensis CAMPAGES 44
joubini CAMPAGES 29
joubini CRANIA **10,** 50
joubini MAGELLANIA 9, **28–30,** 32, 51

kerguelensis MAGELLANIA 26, 46, 58
kerguelensis WALDHEIMIA 26, 27, 46, 47, 48, 51
KINGENA 7, 39, 57
KRAUSSINA 6, 7, 40, 44, 45, 47–49, 52, 55–58

LACAZELLA 39, 49, 54
laevis DISCINISCA 38, 49
lamarckiana MEGERLINA 6, 44
lamellosa DISCINISCA... ... ... 38, 49
LAQUEUS 6, 7
lata MACANDREVIA **33–35,** 36, 51
lecontei CRANIA 10, 50
lenticularis NEOTHYRIS 25, 45
LINGULA 38, 43–45, 51, 52, 54
LINGULACEA 52
LIOTHYRELLA 6–8, **12–19,** 43, 45, 46, 49–52, 54–56, 59
LIOTHYRINA 6, 7, 9, 12–14, 16, 19, 41, 47, 52
LIOTHYRIS 6, 14, 46, 52, 57
lutea ARGYROTHECA 6

PAGE

MACANDREVIA 7, 9, **33–36,** 37, 41, 50–52, 55, 56
macquariensis MAGELLANIA **30–31,** 46
MAGADINA 44, 45, 52, 54–56
MAGADINELLA 54
MAGASELLA 44, 52
MAGELLA 32, 46, 54
MAGELLANIA 9, 23, 25–27, **28–32,** 40, 44–46, 49–59
MAGELLANINAE 7, **23–33,** 35, 46, 52, 56, 58
mawsoni GYROTHYRIS 23, 24, **28,** 46
maxilla THECIDELLINA 44
mayi ARGYROTHECA 43, 44
mayi TEREBRATELLA 24
mediterranea LACAZELLA 39, 49
MEGATHYRINÆ 7, **20–23**
MEGATHYRIS 21, 54
MEGERLIA 7
MEGERLINA 6, 7, 45–47, 49, 52–57
minor TEREBRATULA 13, 48, 49
monstruosa MÜHLFELDTIA 21
MORRISIA 21
moseleyi LIOTHYRINA 13, 16
moseleyi TEREBRATULA 13, 16
MÜHLFELDTIA 6, 7, 21, 57
MURRAVIA 7, 43, 45, 52, 54–56, 58
murrayi EUCALATHIS 45
murphiana LINGULA 43

NEORHYNCHIA 40
NEOTHYRIS 7, 23–27, 45, 46, 54–56
neozelanica LIOTHYRELLA **17–19,** 22, 30, 45
nigricans HEMITHYRIS 12, 45
notorcadensis LIOTHYRELLA 12, 50
novara NEOTHYRIS 24, 25

oamarutica LIOTHYRELLA 19
ovalis NEOTHYRIS 25, 26, 45
ovata LIOTHYRELLA **15–16,** 51

PACHYMAGAS 23, 24, 54
parki PACHYMAGAS 24
patagonica CRANIA 10, 49
pectoralis STETHOTHYRIS 25, 27, 28
PELAGODISCUS 38, 40, 50
pisum KRAUSSINA 49
PLATIDIA 6, 7, 20, 21, 39, 47, 51, 52, 57, 58
psittacea ANOMIA 11
psittacea HEMITHYRIS 11, 12
punctata TEREBRATULA 9
pyxidata HEMITHYRIS 12, 46

PAGE

quadrangularis Crania 10

racovitzæ Hemithyris 12, 50
racovitzæ Rhynconella 11
radiata Terebratulina 43, 48
radula Terebratulina 43
reevei Lingula 44
rhizoida Rhizothyris 25
Rhizothyris 25, 26, 54
Rhynconella 11, 12, 40, 44
Rhynconellacea **11–12,** 52
Rhynconellidæ 40
rosea Bouchardia 49
rostrum Lingula 43, 44, 51
rubicunda Terebratella 24, 28, 35, 46
rubiginosa Terebratella 24, 49, 58
rubra Kraussina 6, 48
rubra Terebratula 31

sanguinea Terebratella 24, 31, 46
sanguinolenta Frenulina 44, 45, 51
seminula Amphithyris 23, 47
seminula Morrisia 21
seminulum Terebratula 21
septentrionalis Terebratulina 48
smithi Waldheimia 31, 50
squamosa Hemithyris 58
stearnsi Liothyrina 16
stella Discinisca 44
Stethothyris **23,** 24–26, **27–28,** 51, 52, 54–56
strebeli Neorhynchia 40
striata Hemithyris **11–12,** 50
submutica Terebratella 24
suessi Crania... ... ... 10, 43
suessi Terebratulina 58
sufflata Magellania 59
sulcata Magellania 28

tateana Liothyrella 13, 16, 59
Terebratella 7, 23–25, **31–32,** 40, 45, 46, 49–52, 54–58
Terebratellidæ 7, **20–36,** 52, 56, 57, 59
Terebratula 7, 12–14, 16, 21, 31, 40, 41, 47–49, 52, 58
Terebratulacea **12–36,** 52
Terebratulidæ 6, 7, **12–19,** 52
Terebratulina 6, 7, 43, 45, 47, 48, 52, 54–56, 58
Thecidea 6
Thecidellina 44, 54, 56
truncata Mühlfeldtia 21
tumidula Lingula 43, 44, 51

PAGE

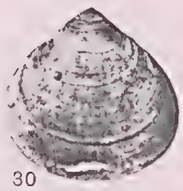
uttleyi STETHOTHYRIS 23–25, **27**
uva LIOTHYRELLA 12, 13, 19, 49, 50
uva LIOTHYRINA 15
uva LIOTHYRIS 14, 46
uva TEREBRATULA 12–14

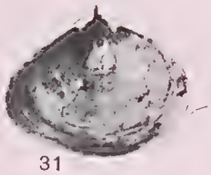
vanhöffeni MACANDREVIA 33, 34, **35–36,** 51
venosa ANOMIA 26, 27
venosa MAGELLANIA 26, 50, 55
vercoi MAGASELLA 44
vitrea LIOTHYRINA 13, 16, 19
vitrea TEREBRATULA 13, 48, 49

WALDHEIMIA 7, 26, 41, 46–48, 50–52, 54
willemœsi ALDINGIA 44
winteri LIOTHYRINA 13, 47
wyvillei DYSCOLIA 39
wyvillei TEREBRATULA 40, 41
wyvillei WALDHEIMIA 26, 41

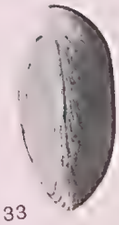
zelandica TEREBRATULA 31

NATIONAL MUSEUM MELBOURNE

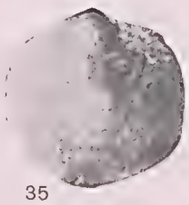

30

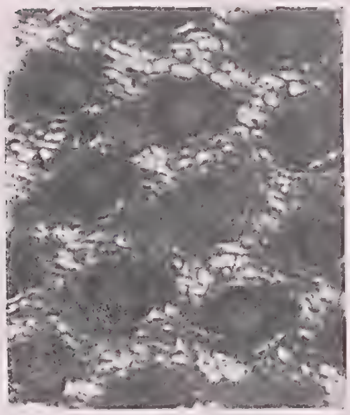

31

32


33

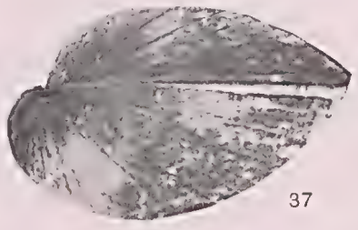
34

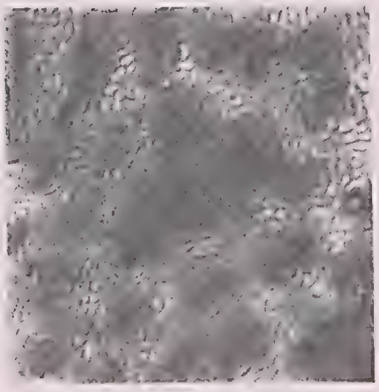

35

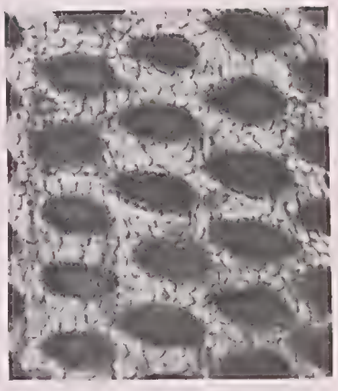

39

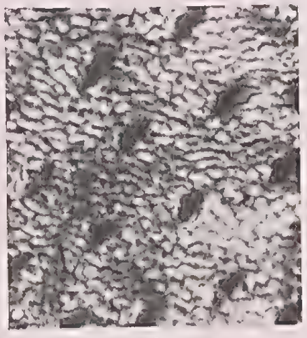
38

36


37

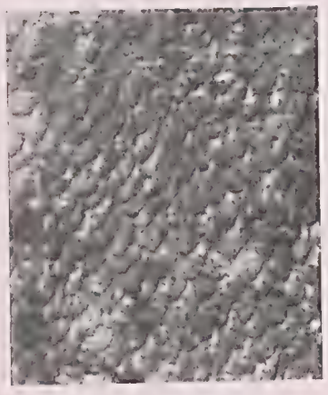

40


41

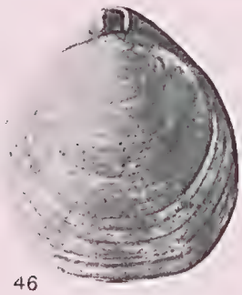

42

43

44

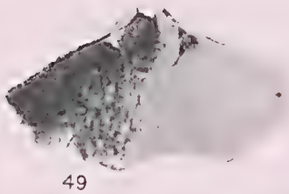

45

NATIONAL MUSEUM MELBOURNE


46

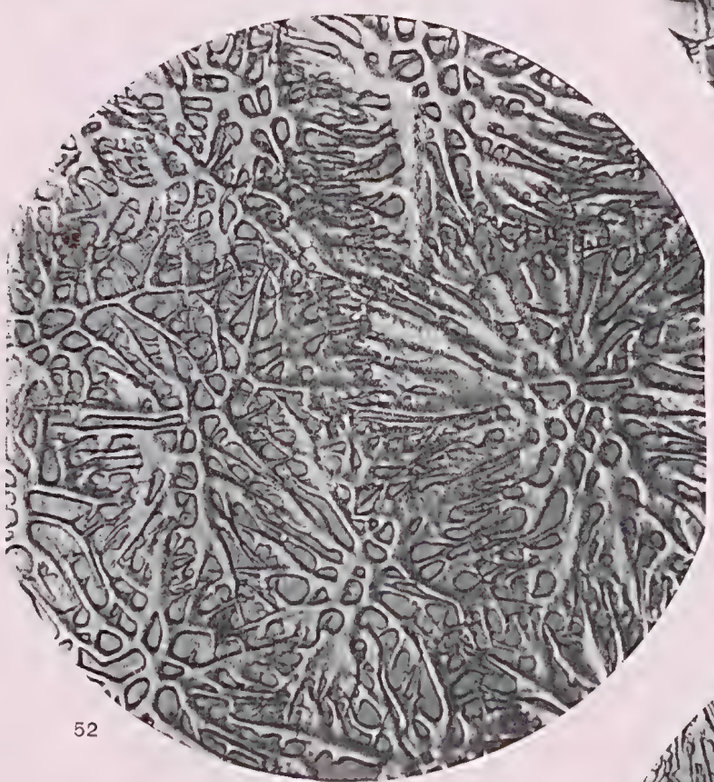
47

48


49

50

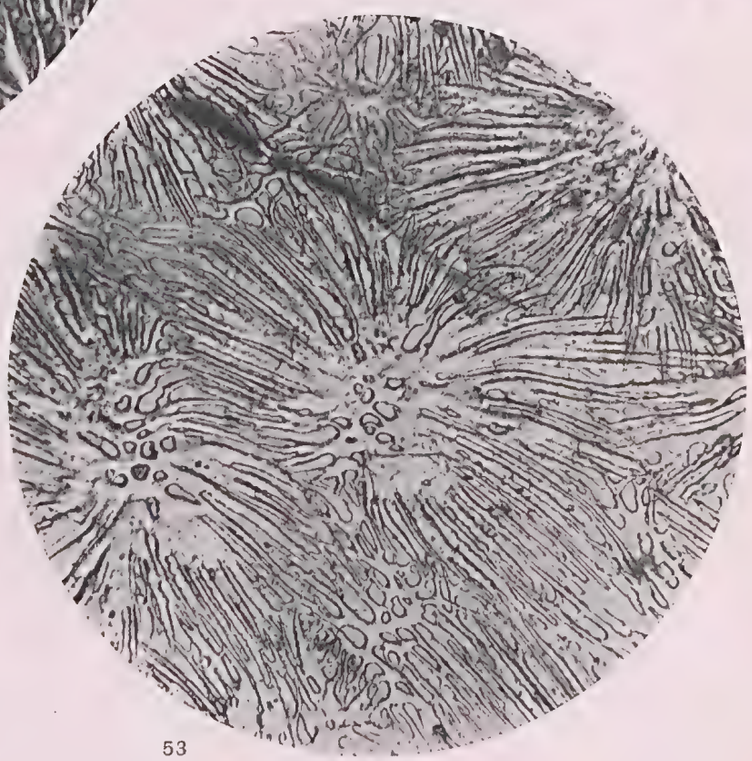
51


52

54

55

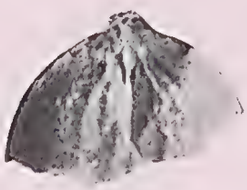
56


53

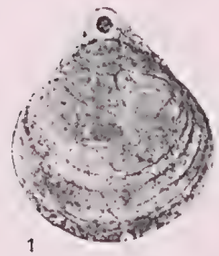
57

58

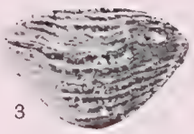
59


60

NATIONAL MUSEUM MELBOURNE


1

2

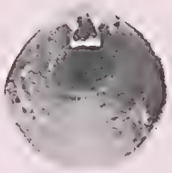

3

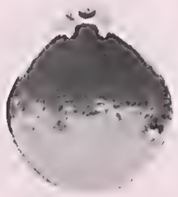
6

7

4

5

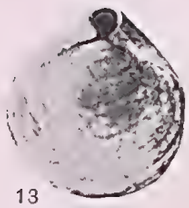

8


9

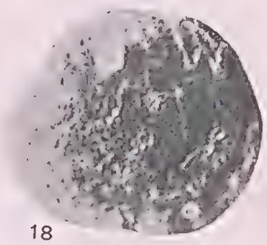
10

11

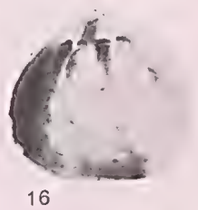
12


13

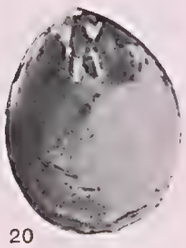
14

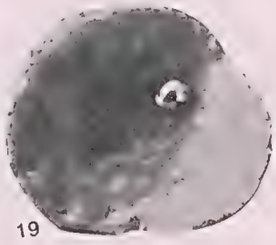

18

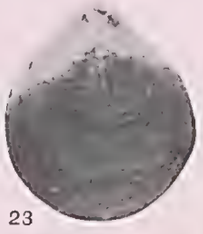
15


16

17


20


19


23

24

21

29

25

26

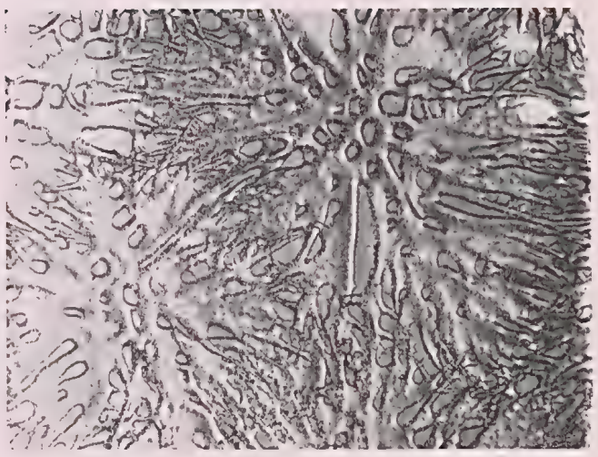
22

27

28

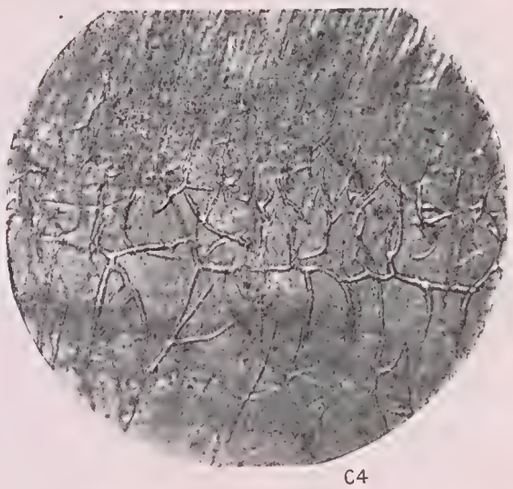
NATIONAL MUSEUM MELBOURNE

61

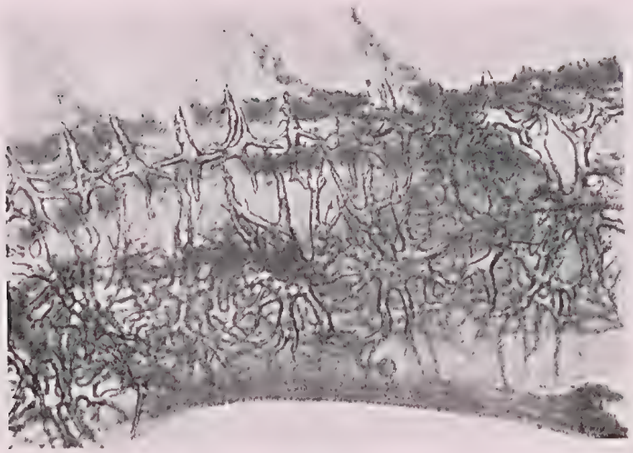


62

63



64



65

66

NATIONAL MUSEUM MELBOURNE

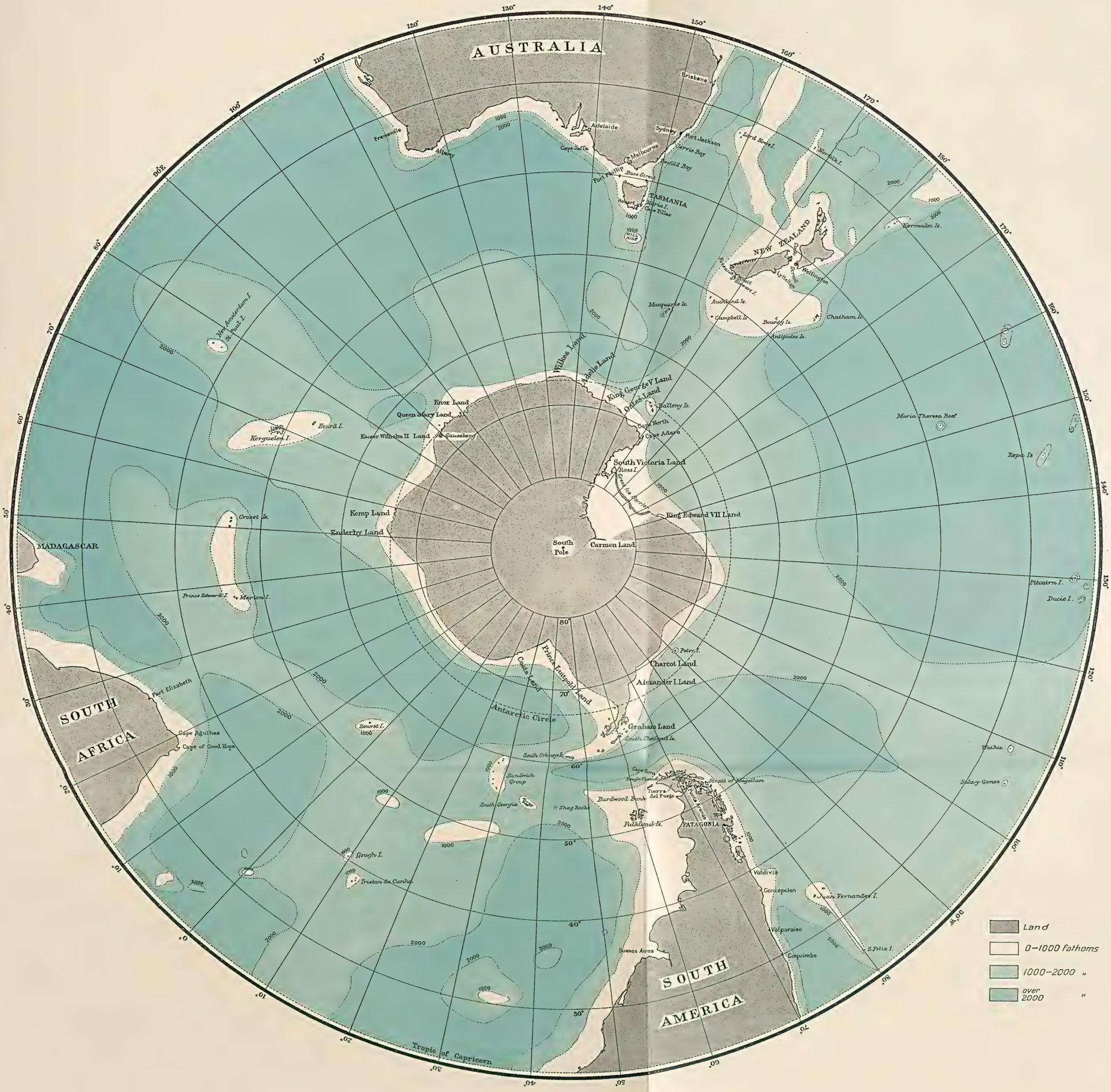
Downloaded from www.libtool.com

BATHYMETRIC MAP
OF THE ANTARCTIC AND SOUTHERN OCEANS

COMPILED BY

J.A. THOMSON

1917.



Series C.—REPORTS IN COURSE OF PREPARATION.

ZOOLOGY.

FORAMINIFERA	Mr. F. Chapman, A.L.S., F.R.M.S., National Museum, Melbourne.
MONAXONID SPONGES AND TETRAXONID SPONGES.	Mr. E. F. Hallmann, B.Sc., University, Sydney.
HEXACTINELLID SPONGES	Prof. I. Ijima, College of Science, Tokyo, Japan.
CALCAREOUS SPONGES	Prof. A. S. Dendy, F.R.S., D.Sc., F.Z.S., King's College, London.
HYDROZOA	Mr. E. A. Briggs, B.Sc., Australian Museum, Sydney.
ACTINOZOA	Prof. J. Arthur Thomson, F.R.S., University, Aberdeen.
TREMATODES	Dr. S. J. Johnston, University, Sydney.
CESTODES	Dr. T. Harvey Johnston, University, Brisbane.
NEMATODES (FREE)	Dr. N. A. Cobb, Bureau of Plant Industry, Washington, U.S.A.
CHÆTOGNATHA AND ACANTHOCEPHALA	Dr. T. Harvey Johnston, University, Brisbane.
ROTIFERA AND TARDIGRADA	Mr. J. Shephard, Melbourne.
ECHINOIDEA	Prof. R. Koehler, Université, Lyon, France.
ASTEROIDEA AND OPHIUROIDEA	Prof. R. Koehler, Université, Lyon, France.
CRINOIDEA AND HOLOTHUROIDEA	Prof. M. Vaney, Université, Lyon, France.
ANNULATA (EXCEPT LEECHES)	Prof. W. B. Benham, M.A., D.Sc., F.R.S., University of Otago, Dunedin, New Zealand.
LEECHES	Chas. Badham, B.Sc., University of Sydney
CRUSTACEA CUMACEA	Dr. W. T. Calman, British Museum, London.
CRUSTACEA SCHIZOPODA	Dr. W. M. Tattersall, University Museum, Manchester, England.
CRUSTACEA AMPHIPODA AND C. ISOPODA	Prof. C. Chilton, M.A., D.Sc., F.L.S., Canterbury College, Christchurch, New Zealand.
CRUSTACEA MACRURA AND C. CIRRIPEDA	Miss F. Bage, M.Sc., F.L.S., University, Brisbane.
MALLOPHAGA	Dr. T. Harvey Johnston, University, Brisbane, and Mr. L. Harrison, B.Sc., Sydney.
TICKS	Mr. L. Harrison, B.Sc., Sydney.
PYCNOGONIDA	Prof. T. T. Flynn, B.Sc., University of Tasmania, Hobart.
BRACHIOPODA	Dr. J. A. Thomson, Dominion Museum, Wellington, N.Z.
TUNICATES	Prof. W. A. Herdman, F.R.S., University, Liverpool, England.
CEPHALODISCUS	Mr. R. Ridewood, B.Sc., British Museum.
BIRDS	Mr. H. Hamilton, Dominion Museum, Wellington, N.Z., and Mr. R. Basset Hull, Sydney.
MAMMALS	Mr. H. Hamilton, Dominion Museum, Wellington, N.Z.

BOTANY.

MOSSES	Rev. W. W. Watts, Sydney.
PHYTOPLANKTON AND FRESH-WATER ALGÆ.	Prof. F. E. Fritsch, University of London
LICHENS AND FUNGI	Mr. E. Cheel, Botanic Gardens, Sydney.
MARINE ALGÆ	Mr. A. H. S. Lucas, M.A., B.Sc., Grammar School, Sydney.
VASCULAR PLANTS	Mr. T. F. Cheeseman, F.L.S., F.Z.S., Auckland Museum, N.Z.

NATIONAL MUSEUM OF VICTORIA

P
508.989
A938

MU450